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F22

THE

FAR-EASTERN REVIEW

Volume

XVIII.

SHANGHAI:
THE FAR EASTERN REVIEW
1922.

The Far Eastern Review

AUTOMOTIVE NUMBER

JANUARY, 1922

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

Type	To-day's Price	Price Jan., 1921	Reduction
2-2½-ton Standard Lorry Chassis...	£730	£ 997	*£267*
2-2½-ton Long Char-a-bane Chassis	£750	£1,007	*£257*
3½-4-ton Lorry Chassis	£865	£1,195	*£330*
3½-4-ton Char-a-bane Chassis ...	£880	£1,190	*£310*
4-ton Long Wheelbase Omnibus Chassis	£950	£1,200	*£350*
5-6-ton Lorry Chassis	£960	£1,320	*£370*

The prices given above are F.O.B. Guildford, England

WITH a view to stimulating trade and maintaining employment, we have written down our Stocks to a figure very much under cost, and this, with the wages reductions that will take place in the near future, has enabled us to sell our Chassis as from October 1st at the prices mentioned opposite.

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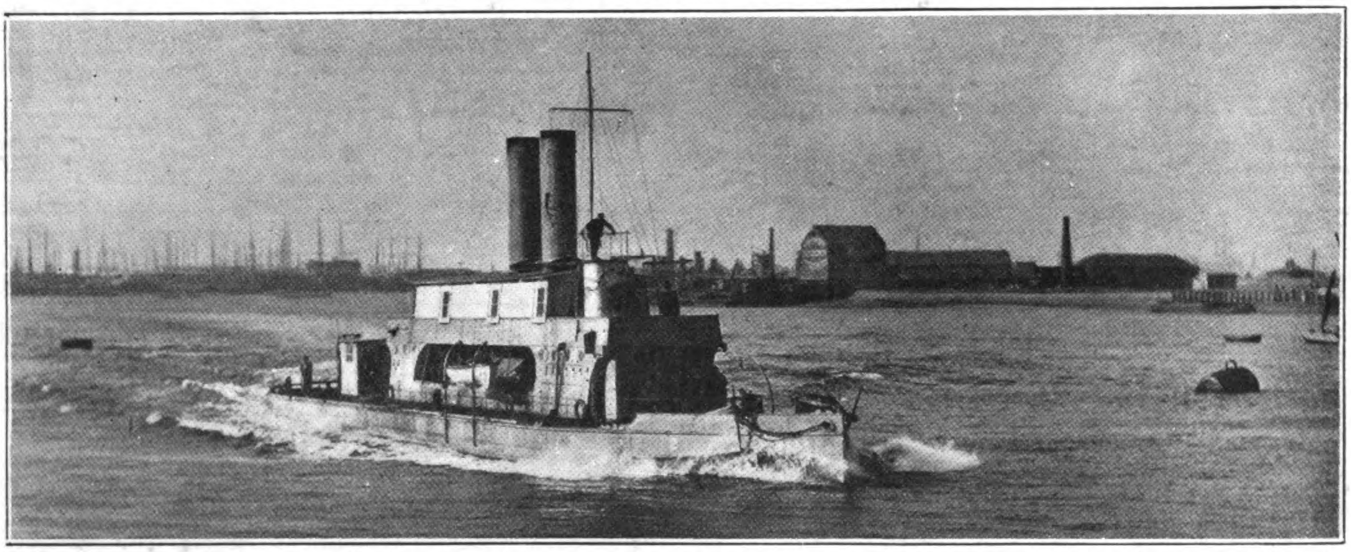

Length, 160-ft.; Beam, 24-ft. 6-in.; Draft, carrying 40 tons, 2-ft. 3-in; Speed, carrying 40 tons, 15 Statute miles an hour, burning wood fuel only.

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The Market for Motor Vehicles in China

By Geo. Bronson Rea

THAT China offers one of the greatest fields for the expansion of motor traffic is being emphasized by the wide-spread demand for good roads, the organization of companies for their construction and the orders that have been placed for motor vehicles. A review of the market discloses an unusual activity in all sections of the vast country in opening up new communications for commercial and military purposes. While it is too early to say that road building in China has been taken up in that serious frame of mind that impels other peoples to gridiron their lands with arteries of communication, it may be said that a good beginning has been made, and, if funds can be found for continuous construction and maintenance, the future holds bright for the development of a huge market for motor vehicles of all kinds. This phase of China's development can be traced largely to the fact that for eight years, railway construction has been practically at a standstill, with very little hope that funds on a large scale will be forthcoming from abroad for the resumption of work. Cities and towns in the interior, which cannot hope to be connected by rail, are turning their attention to the cheaper method of road communication, which calls for little more than the use of the over-abundant local labor in grading, rolling and, in some cases, of breaking stone.

These encouraging signs are also traceable to the excellent campaign being carried on by the good roads movement in the interior. Could capital be more readily obtained for road-making purposes, a boom in the automobile trade would follow. Unfortunately, there is little security for foreign capital in such enterprises, other than that supplied by the central or provincial governments, and such advances would have to come under the scope of the consortium. The delays in arriving at some understanding whereby this international financial combination can come to the assistance of China, eliminates this method of financing the construction of new roads, and throws the burden upon private Chinese initiative.

It speaks well for the enterprise of the Chinese that many private road and auto-transportation companies have been formed, or are in process of promotion. Some of these schemes, like those in the Shanghai district, are of great importance calling for large sums to swing them. It also augurs well for their success that they are largely private enterprises controlled by the merchants who expect to derive their profits and maintenance costs from the operation of motor vehicles. Up to the present, aside from the service across Mongolia, the government seems to have left this field open to private initiative, and even after constructing highways at its own expense (as in the case of the Chefoo-Weihsien highway) has thrown the roads open to private companies who pay for the franchise to operate auto-transportation services.

If ways could be found for foreign capital to assist in this development through taking up the securities of the stronger native banks a great impetus would be given to the automobile trade with China. It would seem that here is a field that the many sino-foreign banks (as distinguished from those embraced in the consortium) could exploit to advantage. Although a review of the market for motor vehicles is highly encouraging, we would not have it thought that we are predicting an immediate boom. Far from it. All the elements are here, however, for a rapid development depending entirely upon the extension of new roads. It may be taken for granted that wherever such a road is built connecting one town or village with another, the automobile and truck will follow. Whatever aid or financial encouragement can be extended by foreign banks or investors to the Chinese banks who directly finance these roads, is so much capital contributed to the expansion of the automobile trade. All the elements are also here for the development of a business that will carry with it the old familiar clause giving preferential treatment to the nation supplying the necessary financial assistance. The struggle for the Chinese automobile trade will undoubtedly revive the system of financing roads, on the condition that certain types of automobiles or trucks are purchased; purely private engagements between banks, in which the government cannot interfere, or other nations claim that the door is being closed to them.

Notwithstanding the risks involved in financing enterprises over which no control can be exercised, we incline to the belief that these would be largely eliminated through foreign financial co-operation with the more important native banks, who would see to it that their interests were fully protected. Otherwise, left to purely native initiative and capital, the demand for motor vehicles will fall far short of foreign expectations. The competition for the sale of cars and trucks in China as the field widens, will undoubtedly pave the way for some measure of foreign financial co-operation with the Chinese banks, to ensure that orders for cars will be placed in the country furnishing the financial assistance. If American, British, French, German, Japanese, Norwegian and other capital can co-operate harmoniously and profitably with Chinese in the conduct of banking in China, it would seem that these institutions might assist in providing the much needed capital required for the construction of new roads and expanding the automobile trade in China. The field is wide and important enough for the creation of a special sino-foreign bank working in with the leading Chinese financial institutions to specialize in these securities. A most important highway is now being surveyed between Chengtu and Chungking in Szechuan, which we assume would be facilitated by financial assistance in the shape of long-time debentures. While it would be out of the question for foreign investors to hazard their money direct in such an enterprise, yet if these road bonds were issued through the Young Brothers Banking Corporation of Chungking, the strongest financial institution in Szechuan, it would seem that a way would be opened for foreign banks or sino-foreign banks to handle their securities. Nothing would contribute more to the advancement of trade in China than the building of highways in Szechuan, as for many years to come, the much-talked-of railway into this province must remain on paper. Roads that will permit the produce of this rich province to reach the Yangtze and be transhipped to the fleet of shallow draft steamers plying between the river ports and Ichang, constitutes the only immediate hope of opening up this province.

The importance of the Far Eastern market has been brought home to the American manufacturers of automobiles and the department of commerce is sending out to China a special automobile expert to study the conditions here and aid American manufacturers to increase their exports. The decision was reached by the commerce department in the middle of Novem-

ber to send the commissioner to foreign countries for surveys of automobile markets and help American builders who must have world-wide markets for their full-time operations. The commissioner, Mr. William I. Irvine, will sail from San Francisco on January 12.

The value of the China market is seen in the recent report of the British commercial attaché at Peking who says that "Motor cars to the value of over one million sterling were imported into China in 1920. The bulk of these cars came from the United States, but British cars are being seen in increasing numbers in the streets of Shanghai and other large towns. Unfortunately the cheapest British cars that come to China are far more costly than American cars of similar model and power, and, unless some drastic reduction in the price of British cars can be effected, Mr. Fox does not see any hope of their being able to compete successfully in the market."

"It must be remembered that as there are as yet no good roads in China, cars are chiefly used for town work, and there is no doubt at all that for crowded traffic and narrow streets with sharp turnings the American car is far more suitable than the British vehicle. When the roads in China permit of making long-distance runs, and when ability to climb hills is a factor that counts, then no doubt the British car will come into its own.

"In the meantime it is satisfactory to note that British motor-car manufacturers have begun to realize the possibilities of the China market and that several of our leading makers have recently concluded agency agreements with local garages. Motor trucks and lorries are coming into general use for transport purposes, and there should be a great future for this class of vehicle in China."

Further comment on the automobile trade in China appeared in *Finance and Commerce*: "China's last year's importation of motor cars amounted to the respectable figure of Haikwan Tls. 3,447,219, of which America supplied cars to the value of Tls. 2,191,664, Great Britain just a quarter of America's total, and Japan (re-exportations of foreign-built cars) just half of Great Britain's total, with Canada's share standing at Tls. 390,000. This is a remarkable showing. That China should import less than 3½ million taels worth of motor cars in a year when her total import trade was just less than Tls. 780,000,000 is perhaps not startling, but to those who know the conditions in this country it is a portent of the most striking development in motor-car distribution. For it must be remembered that China has not been a big buyer of motor cars until the last year or two. In 1912 her total purchases were valued at about a quarter million taels (of which Shanghai took two-thirds). In 1914 the total purchases did not amount to more than half a million taels. By 1918 it had risen to 1.3 million taels, so that it can be seen that only during the last two years has there been any rapid growth. Shanghai, of course, has always been the biggest buyer. Last year her share of the trade was Tls. 1,782,934 (compared with Tls. 589,877 in 1918), and Tientsin (whose purchases in 1912 were only Tls. 58,000, and in 1918 only Tls. 397,000) bought in 1920 cars to the value of Tls. 1,140,750. If one can imagine an inter-provincial network of macadamized high roads in China, the mind staggers at the probable number of cars that might be sold in this country during a decade. It must be said to America's credit, says the journal, that her agents are aggressive in "beating up prospects," and it is questionable whether the American car can be competed with on price. But it does seem a pity that British manufacturers are not alive to the great headway that motor car traffic is making in this country."

The table appended shows the number and value of automobiles and motor trucks imported into Shanghai for the years 1912 to 1920:

AUTOMOBILES AND MOTOR TRUCKS IMPORTED INTO SHANGHAI, CHINA, 1912-1920

Year	Number	Gross and Value in Gold Dollars	Year	Number	Gross and Value in Gold Dollars
1912	116	118,495	1917	504	481,485
1913	162	205,600	1918	700	954,261
1914	217	278,996	1919	961	*1,491,741
1915	169	183,694	1920	1,397	*1,938,944
1916	350	371,732			

*Net value.

The review of road construction in China, commencing on the next page, compiled from the latest authentic and official sources, will help to give some idea of the increasing value of this market and the need for adequate support to the good roads movement facilitating its expansion. This survey is not complete, as limitations of space compel the omission of many items of interest connected with modern road construction and the establishment of motor transportation companies.

To Sianfu by Autobus

WHAT promises to be one of the most important transportation enterprises in China has been organized by Shensi merchants under the name of the Si Tang Motor Service Company, which will operate buses from Shenchow in Honan, to Sianfu, the capital of Shensi, a distance of 470 *li* (156 miles). The funds for the construction of the road and the purchase of automobiles is now being subscribed. It is estimated that $500,000 will be required. Perhaps there is not another road in China that witnesses such heavy traffic as this main artery between Sianfu and the Yellow River town of Shenchow. Along its route is borne the trade of northwest China and a large part of that of Tibet. Some idea of the traffic may be gleaned from Mr. Eric Teachman's description of a trip made over the existing road four years ago in his recent book, "Travels in Northwest China." Speaking of the railway trucks on the Peinlo line, which terminated at that time at Kuanyintang, he said "the sight of the swarms of Chinese packed into the string of open trucks running backward and forwards on this incomplete section testifies to the popularity of railway travel on this road and to the number of travelers." "The traffic on the road from Shenchow on is immense, and an almost constant stream of carts and pack mules laden mostly with cotton and hides on their way from Shensi to the coast, is met."

The traffic on the roads of the fertile and populous Wei River plain is very great, and it is one of the absurdities of modern China that no railway should as yet connect Sianfu, the metropolis of the northwest, with the coast. Railway construction on the plains of central Shensi means little more than laying the rails on the necessary embankment and building a number of small bridges across the streams which flow down from the Ch'ingling Shan into the Wei River . . . Failing railways, the construction of a few good trunk roads fit for motor traffic would be of enormous advantage to the province and could be undertaken, as far as the plains of Central Shensi are concerned, at comparatively small cost."

From this short description, it would seem that the company now being promoted by the merchants of Shensi has a brilliant future ahead of it.

* * *

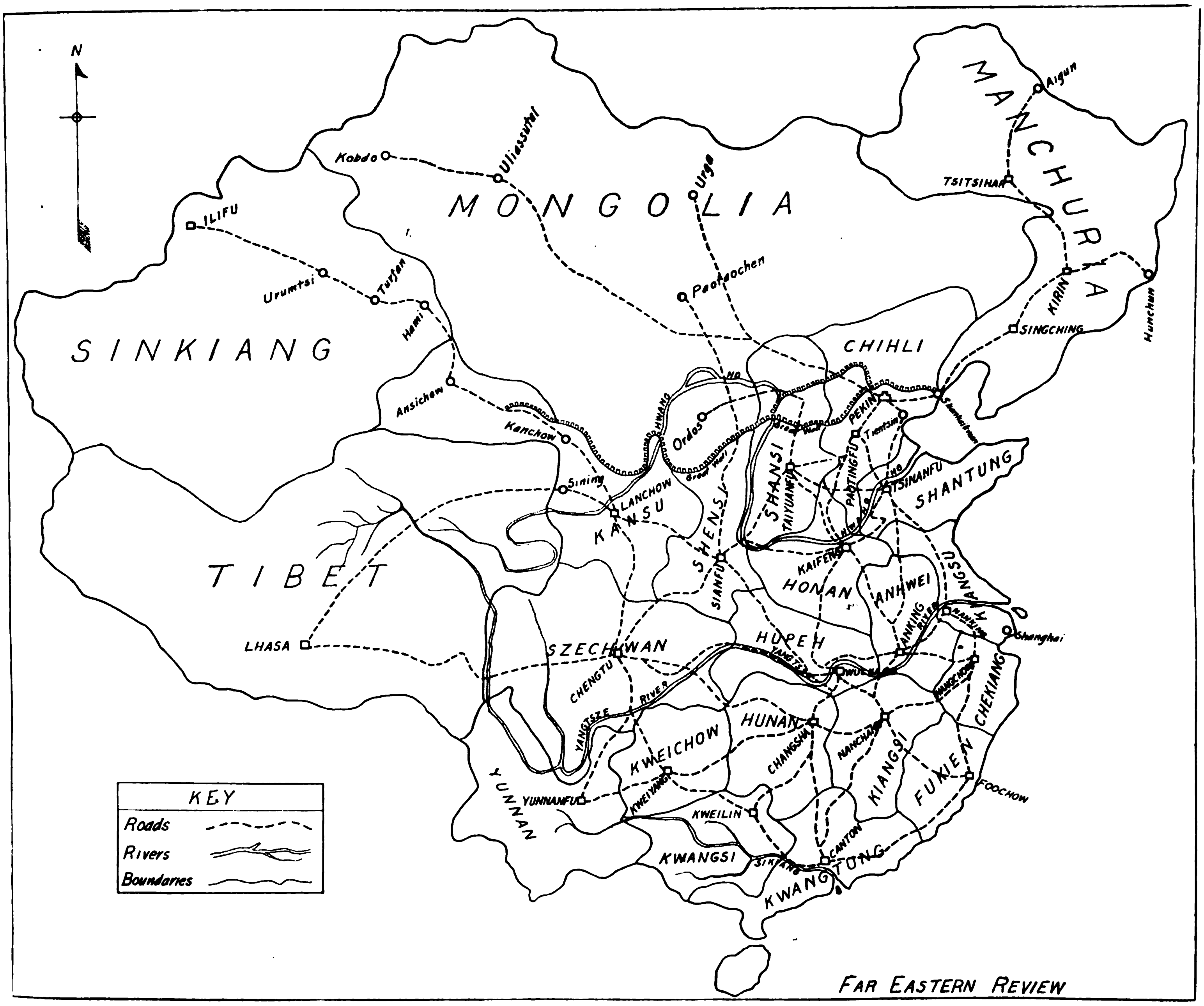
The Chin Chih Chen Communications Society of Ningpo propose to organize a long-distance automobile company.

* * *

Traffic has started from the Ta Da Wharf, Nantungchow to Tau Hua Oo. The roads office runs an automobile service for the transportation of goods and passengers at moderate fares.

* * *

Wang Ling-ke, owner of the Heng Feng Native Bank of Wuhu and others, are planning to establish a long-distance automobile service to run between Wuhu and Hsuanchen. They are also planning to construct good roads.



Suggested National Highway System for China designed by Mr. P. T. Chow, Road Expert in the Ministry of Interior, Peking. Mr. Chow's Scheme called for 51 National Highways having an Aggregate Length of 30,823 Miles, to cost about $10,800 Mexican per Mile, or a total of $332,878,000, Spread over a Period of Ten Years

Modern Roads and Motor Vehicle Transportation in China

IT seems but yesterday when THE FAR EASTERN REVIEW took the initiative in 1914 in the movement for modern roads in China and through its editor, Mr. W. H. Donald, influenced the Peking authorities to enter into a contract with an American syndicate headed by a Detroit automobile manufacturer to build a highway leading out from Peking. Although nothing came of this original venture, the necessity for good roads, if only for mandarin joyriding, was brought home to the Peking authorities, and little by little the streets of the capital and the main roads leading out to the immediate suburbs were macadamized and made safe for motor traffic. Since then, many miles of excellent highways have been constructed around Peking, bringing the Western Hills, Nanyuan and Tungchow within easy reach of the capital by motor. From the few cars owned by the highest officials a few years back, the capital now has 1,308 motor cars, of which 32 are owned by the government, 45 by the diplomatic corps and the remainder by individuals and the garages, an increase over the preceding year of sixty-six per cent. In these figures some idea can be gained of what the future holds out as other large Chinese cities are furnished with good roads. It is difficult to designate any particular Chinese official as the father of good roads as many have since taken up the movement and shoved it ahead until at present it is nation-wide, supported by an organization with headquarters in Shanghai. It may be said, however, that the original advocate of a nation-wide system of highways was Mr. Lo Kou-shui, one of China's foremost foreign-

trained engineers, of the old group of students who went to America in the early eighties and graduated from the Troy Polytechic Institute. While acting as technical secretary and adviser to the ministry of communications in 1913, Mr. Lo strenuously urged the adoption of a highway program as a complement to the construction of a national system of railways then being drawn up. He pointed out that any large investment in new railways would fail to bring adequate returns unless feeders in the form of modern roads were constructed to permit the produce of the tributary districts being cheaply transported to the railway. Mr. Lo's recommendations, however, received little favor because of the fact that the cost of highway construction would have to be borne by the central and provincial governments, while railways could be financed by foreign loans, with considerable profit to the officials concerned. Road building in China buttered no official bread.

Mr. Lo's recommendations still hold good and should be given most careful attention when conditions again permit foreign bankers to take up the question of financing railways in China. If the railways are to pay, the highways must be built to serve as feeders. A national program for railway construction should include provision for a definite highway system.

The seeds sown by Mr. Lo Kou-shui found root in Peking and various other officials of the government have since urged the adoption of a fixed program for a national highway system. Foremost amongst these was Mr. P. T. Chow, road expert in the ministry of the interior, who drew up an excellent program aggregating over 30,000 miles of new roads, calling for the construction of about 3,000 miles the first year at an average cost of $10,800 silver per mile, an excessive estimate when compared with subsequent working costs as obtained by the American Red Cross, averaging $1,800 per mile for earth, and $4,000 per mile for macadam roads. However, the costs obtained by the Red Cross under famine conditions cannot be taken as normal.

Government Road Regulations. - The constant hammering upon the Peking authorities to place such a scheme into practice finally resulted in a presidential mandate being promulgated on November 15th, 1919, laying down regulations for the construction of new roads. These regulations, drafted in the ministry of the interior by the road experts, consisted of 15 articles, the essential points in which are as follows :

"Highways are to be classified under four heads—national, provincial, *hsien* (district), and village highways.

"The national highways are to be those between the capital (Peking) and the provinces, or special administrative areas ; between the capital cities of two different provinces, and between strategical points, harbors and other places of military importance. The width of a national highway is to be 50 feet (Chinese), or more.

"Provincial highways embrace those between the capital city of the province and the different *hsien* cities under its jurisdiction ; between different *hsien* cities ; and between railway, mining, commercial and industrial centres, and places of military importance within a province. The width is to be at least 30 feet.

"The *hsien* highways are to be those between the *hsien* cities and the rural districts under its jurisdiction ; those connecting the different rural districts of a *hsien* ; and those connecting a *hsien* city with river or sea ports, or railway, mining or industrial centres in the neighborhood. The width of *hsien* roads is to be 24 feet or more.

"Village highways are to be those between different villages, those connecting the villages with schools, factories and other public works in the neighborhood. The width of these roads is to be decided by the public bodies of the centres concerned.

"National highways are to be designed by the ministry of the interior. Provincial highways are to be designed by the highest provincial officials concerned, who will, however, have to submit their plans to the ministry of the interior, which will also decide what sections are to be built, and the time in which they are to be completed. The ministry of the interior reserves to itself the right to create special organs for the construction of national highways under its direct control.

"The *hsien* highways are to be planned by the district magistrates who are to submit their proposals to the provincial authorities. The work of construction is to be carried out under the direction of the magistrates, together with the local self-governing bodies of the districts.

"The width of bridges over canals or creeks is to be fixed according to the width of the type of highway."

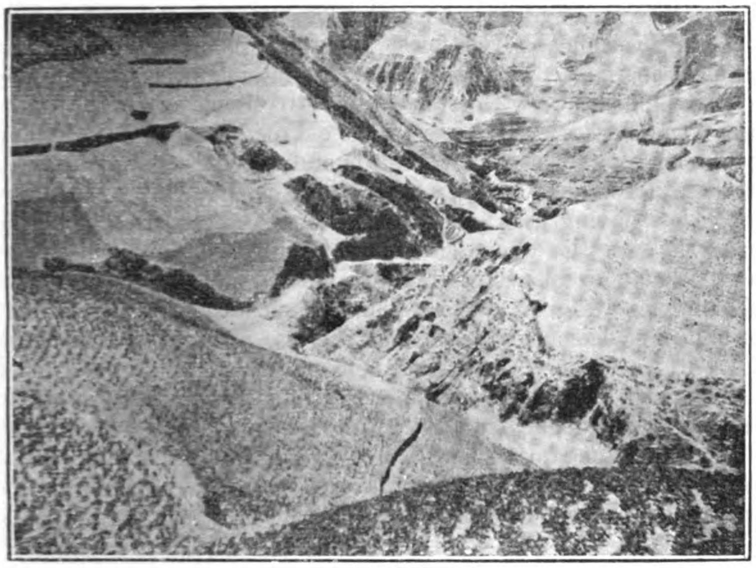
Experience seemed to place these regulations on a par with all others that have flowed out from Peking in a constant stream since the establishment of the republic, but the increasing love of motor car riding on the part of the officials, high and low, assured for them a reception that held out high hopes that they would be carried out. Official activities were spurred on in the north by the various automobile associations, sales agents and others, each with a different motive. The red cross society became active in road work to provide employment for famine and flood sufferers, automobile agents and clubs had their eye on business, the military leaders wanted them in order to move troops rapidly, and others simply desired smooth roads leading anywhere for the sake of pleasure. The same influences are now assuring the construction of roads in all other parts of China, but to the above motives is added the more important one of seeking adequate means of cheap transportation in districts outside the railway zones. We are now witnessing, under the stimulus of the good roads movement and others, the picture of the Chinese authorities being moved from below, the initiative coming from the merchants rather than from the government. On all sides we hear of new road building companies whose ultimate object is to provide automobile transportation to districts now isolated and stagnating because of inadequate means of communication. Under the stimulus of profits for the promotors, squeeze for officials and revenue for the central and provincial treasuries, the Chinese have found the key to the rapid development of highways and its resultant business in automobiles and trucks. Companies are being organized in all parts of the country to build roads and operate autobus services, but the ministry of the interior must first give its sanction and the company must file its application for registration and permit to function with the ministry of agriculture and commerce, in addition to obtaining permits from the local authorities. So here we find a combination of conditions which brings the authorities and business interests into harmonious relations that is resulting in benefits to the people and to foreign manufacturers who have road-making machinery, tools and automobiles to sell.

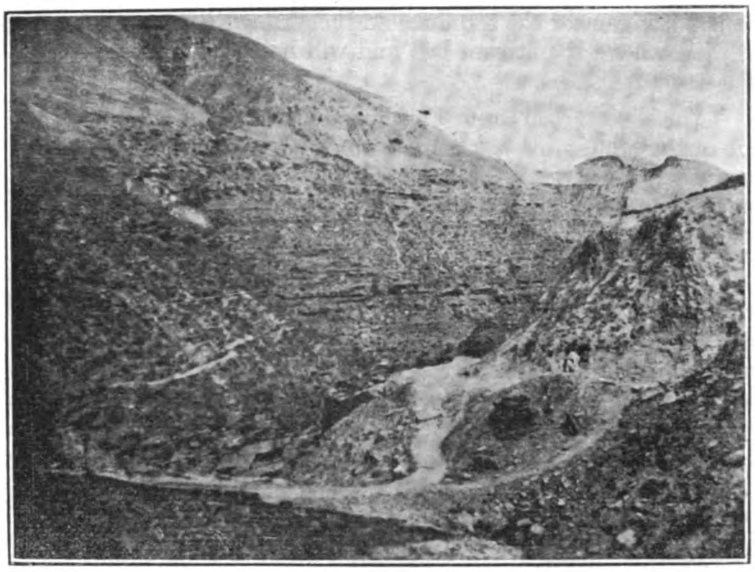
Aside altogether from the good work of the good roads movement, the greatest impetus given to road building and automobile transportation in North China arose from the famine relief activities of the American and other national red cross societies last winter, when over 856 miles of new roads were built and turned over to the Chinese authorities by the American red cross alone. This was supplemented by the activities of the ministry of communications, notably in the building of the Chefoo-Weihsien road in Shantung, and now nearing completion. The government recently issued invitations to the public for tenders for the right to use the road for autobus services, the recepits from such franchises to be paid into a fund for road maintenance. Branches from this main highway are to be constructed that will open up the entire northeastern part of Shantung.

North China Roads.—It is, however, in North China that the most progress has been made to date in road construction, where we find the road between Tungchow and Tientsin well under way. A road between Tientsin and Paotingfu, the two capitals of Chihli province, has been built by the military governor, but will have to be reconstructed before it is fit for use by motors. An article dealing with the red cross roads in North China appeared in the October number of THE FAR EASTERN REVIEW. We reproduce the map which shows these roads and the wells sunk in Chihli.

Peking-Tientsin Highway

This road has received more publicity perhaps than any other similar enterprise in China and it has been difficult at times to follow its financing, its route and progress of the work. It was first proposed in 1917 by the American flood relief committee under the leadership of Minister Reinsch and Roger S. Green of the Rockefeller foundation. The American red cross offered to contribute $100,000, if the Chinese would give an equal amount. The red cross money was to be used for the payment of flood-sufferers as laborers on the construction of the road. The Chinese share was to come in materials and the Chinese government was to





SHANSI ROADS

Looking down to the Valley towards Jung Tu from top of the Pass (Le Ja Wan)

Looking down towards Jung Tu from the old Trail

arrange the right of way. Due to political conditions in China, only the first section of the road from Peking to Tungchow was completed. The work of building was managed first by R. A. White of Frazar & Company and later by Capt. McDonnell of the 15th infantry, U. S. A.

For the completion of the road from Tungchow through to Tientsin a loan of $250,000 was entered into in June of 1919 between the metropolitan bureau and the Banque Industrielle de Chine. The total distance is estimated at 98 kilometres, 12 metres wide. The agreement called for a hard earth or sand road, the surface maintained by steam rollers. In addition to the above sum to be used entirely for the purchase of land and general construction work, a further sum of $400,000 was allocated to the road fund from the 1914 Pukow port development loan between the Chinese government and the same bank. The construction of this road has proceeded spasmodically, until it has reached Yangtsun, within a few miles of Tientsin. And here it stops for the present because the police commissioner of Tientsin has prohibited further work, arresting and throwing into jail a foreman and a gang of coolies, under the pretext that the money for the right of way in his territory has not been advanced, and when this was made good, he held that the graves had been unduly interferred with. With this exception the whole road is now in fairly good condition, enabling through traffic of a kind to be caried on. A few short sections have to be repaired, and the sand hills removed in other parts and the "road" will be completed. The prevailing winds in this section of China will always carry the sand and make drifts along the road, according to those who have made the trip. One or two trucks have successfully negotiated the trip between Peking and Tientsin, while many motorists have used the road, making an average time of about five hours between the two cities.

Kalgan to Peking.—The road from Peking to Kalgan has generally been considered impassable except to carts but Mr. Charles Coltman, of the Mongolia Trading Company, and Mr. Williams recently brought two Dodge Brothers cars from Kalgan to the capital over the road on what they termed a "wonderfully rough" trip.

The distance by rail is 116 miles but the road is several miles longer, probably nearer 125 miles. Mr. Coltman considers it marvellous that they arrived with whole cars. They negotiated seemingly impossible stretches of alleged highway, seamed with deep cart wheel ruts and ditches.

Shansi Roads

The governor of Shansi, General Yen Hui-shan, has shown considerable interest in road building and under his initiative a road has been completed connecting Taiyuanfu, the provincial capital, with Taikuhsien an important educational centre distant over 30 miles to the south. Under the new provincial system this road will be continued further south to Pingyangfu, distant from Taiyuan 140 miles. This will pass through Sukow, Kihsien, Pingyaohsien (connecting at this point with the Fenchow-Yellow. River road), Kiehsui, Lingshih, Hwochow, Chaocheng and Hungting. At Pingyang it will undoubtedly be extended along the time honored route through Kiangchow, Wensi, Anyihsien and Chiehchow to Pukow in the extreme southwest corner of the province where it will connect with the Shensi road system. On the north, a road is to be built from Taiyuanfu to Kuohsien, distant 70 miles, passing through Chengtsin and Sinchow. This road will ultimately lead on to the north to Tatungfu and eastwards over the old road to Peking and Wutaishan.

The Pingyao-Jungtu Road.—The most commercially important of the roads built under the red cross supervision is the one in Shansi province which leaves the provincial highway at Pingyao-hsien and passing through the large city of Fenchow terminates at Jung-tu the Yellow River, providing a water outlet to an immensely wealthy district. Writing in the *China Press*, Mr. Wes Williams describes this road as follows :

"The Ping Yao-Fenchow road in its passage westward over the plain crosses the entire drainage area of the province. The road has no grades as there is a difference in the elevation of not more than 17 feet in twenty miles. This road at the top is 22 feet wide and has an average height of a least three feet and a half.

"The dirt work was paid for at the rate of ten cents gold per hundred cubic feet. Later the road was surfaced with ashes. There are only a few small curves and the road could be used at any time for a railroad bed. The only problem in this stretch of road is the bridge across the Fen River. It is expected that the bridge in use at the present time will be washed out in the spring rains. With this in mind, not much money was expended on it.

"The Yellow River road out of Fenchow west crosses the divide between the two rivers Yen and Yellow. Fenchow itself has an elevation of 2,200 feet. To the top of the pass, a distance of 24.9 miles there is an average rise of less than three feet per hundred to an elevation of 5,200 feet above sea level. The decent on the Yellow River side of the pass does not go down so far because this river is higher than the Fenchow plain.

"The road winds around mountains and twists upon itself like a huge serpent. There are fills 90 feet deep, cuts 60 feet deep running for long distances through loess formation and stretches through solid volcanic rock which cost $1.75 gold per cubic foot to blast out a road. In all there are 22 bridges, and 454 culverts.

The last bridge near the terminus on the Yellow River at Chung Tu is 85 feet above the stream bed and will be a two deck, spondrell arch structure.)

"The direct road from Fenchow to Taiyuanfu runs along the edge of the mountains just a little above the level of the plain and gives many fine views. It has required only a small amount of stone-blasting but there is one stone bridge which has twelve arches each being twenty feet in width.

"For these three roads and the narrow road from Fenchow to Yu Tao Ho, the American red cross appropriated silver $721,000 and the Shansi famine relief society (also largely American funds), $250,000 for a total of 173 miles of road.

"None of the three main roads is fully completed. Contracts have been let and the work is under way to finish the big bridge at the terminus and a stretch of stone blasting on the Yellow River road. The contracts call for an additional outlay of approximately $75,000 of which a further grant has been made of $25,000 by the Shansi famine relief society but where the remaining $40,000 is to come from none of the field directors were in a position to say.

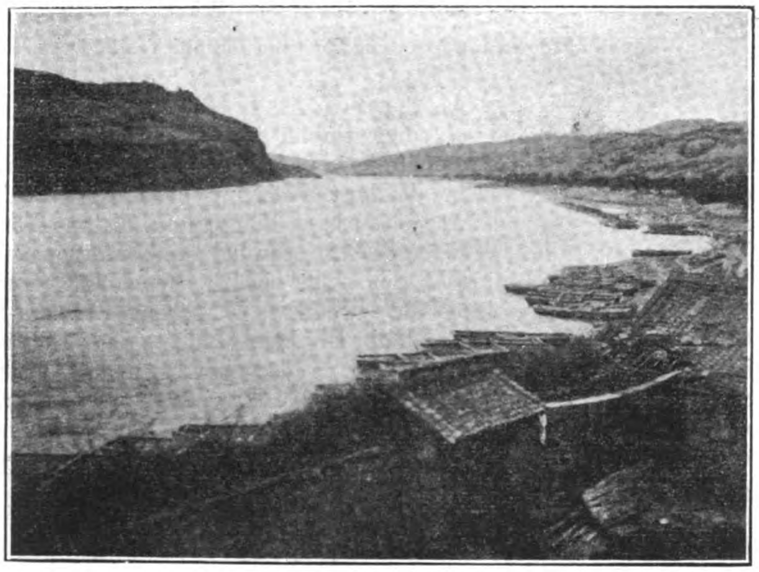
"Half of the 173 miles of road passes through difficult mountain territory and 30,000 laborers were required since operations started in March. At one time they had as many as 50,000 laborers. In all they employed 75,000 different men. Captain McDonnell, U.S.A., was the first engineer to make an investigation of the possible route and in April Major Joseph W. Stilwell took charge as head engineer. His task was an extremely difficult one.

"There were all sorts of questions pressing for decision, complicated problems of construction, supervision of overseers and laborers largely new to such work, the base of supplies a long distance away and none too large a staff of assistants to help him. The enterprise owes much to his tireless energy and practical judgment. Another U.S. army officer who served as engineer for six weeks was Major Horsfall.

"On August 1st, when Major Stilwell left, Mr. Carl Hildebrand, an engineer loaned to the American red cross by the Standard Oil Company, took charge."

The Pingting-Liaochow Road.—Second in importance to the Pingyao-Jungtu road in western Shansi is the one in the eastern part of the province built by the red cross engineers which runs south from Pingting to Liaochow through the heart of the richest coal, iron and pottery district in China. This road brought new life to a section stagnating for lack of communications. Prosperity came to the potters who turned out vitrified clay pipes and drains at extremely low costs while the iron workers found steady work in furnishing shovels, picks, hammers, rollers and other tools required in road construction. A very interesting report on this road by John Andrew Goette was recently circulated by the *Chun Mei News Agency*. He says: "The old road was merely a donkey path that scrambled over river beds and over peaks and which in wet weather was very dangerous. The people had never seen a cart much less having used one. Hence when the famine struck this area, the necessity and desirability of a road running south from Yang Chuan to Liaochow was apparent to all. The engineering difficulties were great. Yang Chuan is on an elevation of 2,184-ft. and in going south a road would have to cross mountain peaks 2,511-ft., 3,128-ft., 4,834-ft. and 5,035-ft. and then drop down to Liaochow at 3,688-ft. in addition to which it would be necessary to cross 12 rivers ranging from 200 to 1,900-ft. in width.

"Work was started late in February with famine relief labor and by August 10th most of it was finished, there remaining some culvert and bridge construction to be finished. The cost per mile is $7,000 Mex. which includes bridges, culverts, surfacing, food for the laborers, medical and engineering supervision, etc.



Looking North up the Yellow River at Jung Tu, the end of the Red Cross Road

SHANSI ROADS

Entering Mut-Sun

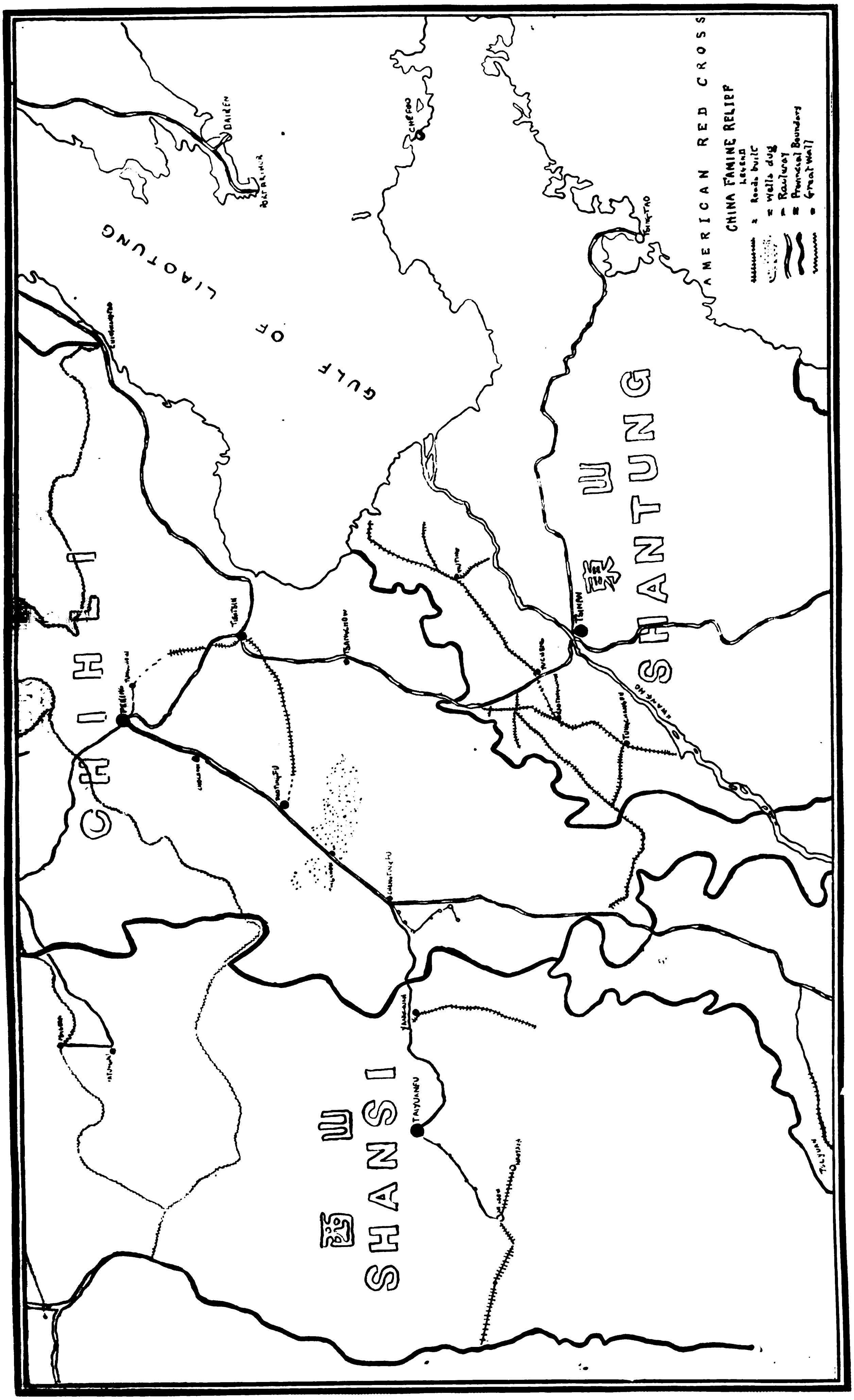
"There were constructed 237 bridges and culverts ranging 135-ft.-in length. Over a thousand feet of stone retaining wall was built; 54 dips., 20-ft. wide and from that same length to twelve hundred feet long were paved.

"The road has a mean width of twenty feet and in some of the sharper curves on the high peaks it broadens out until it is nearer thirty.

"Surfacing is well along, there being three materials employed. On the level stretches the loess is packed down very hard. Where the road runs close to the blast furnaces, iron slag is used to good advantage. This makes a pretty looking black road which is practically dustless and not subject to bad cutting up. The third method is loose stones gotten from the blasting operations, which are well tamped. In one place it was necessary to blast about a mile of solid rock to put in the road. In others the loess was cut away to a depth of thirty or forty feet.

"The greatest grade is only 7.7 per cent. and this lasts but for 0.28 per cent. of the length. Over 84 per cent. of the road has a better grade than 5 per cent. The four automobiles making the inspection trip had no difficulty whatsoever in making the pulls or the turns.

"That the surface of the road is good, is borne out by the fact that a motor car made the eighteen-mile run from Le Ping to Pingtingchow in forty minutes and the six-mile trip from Pingtingchow



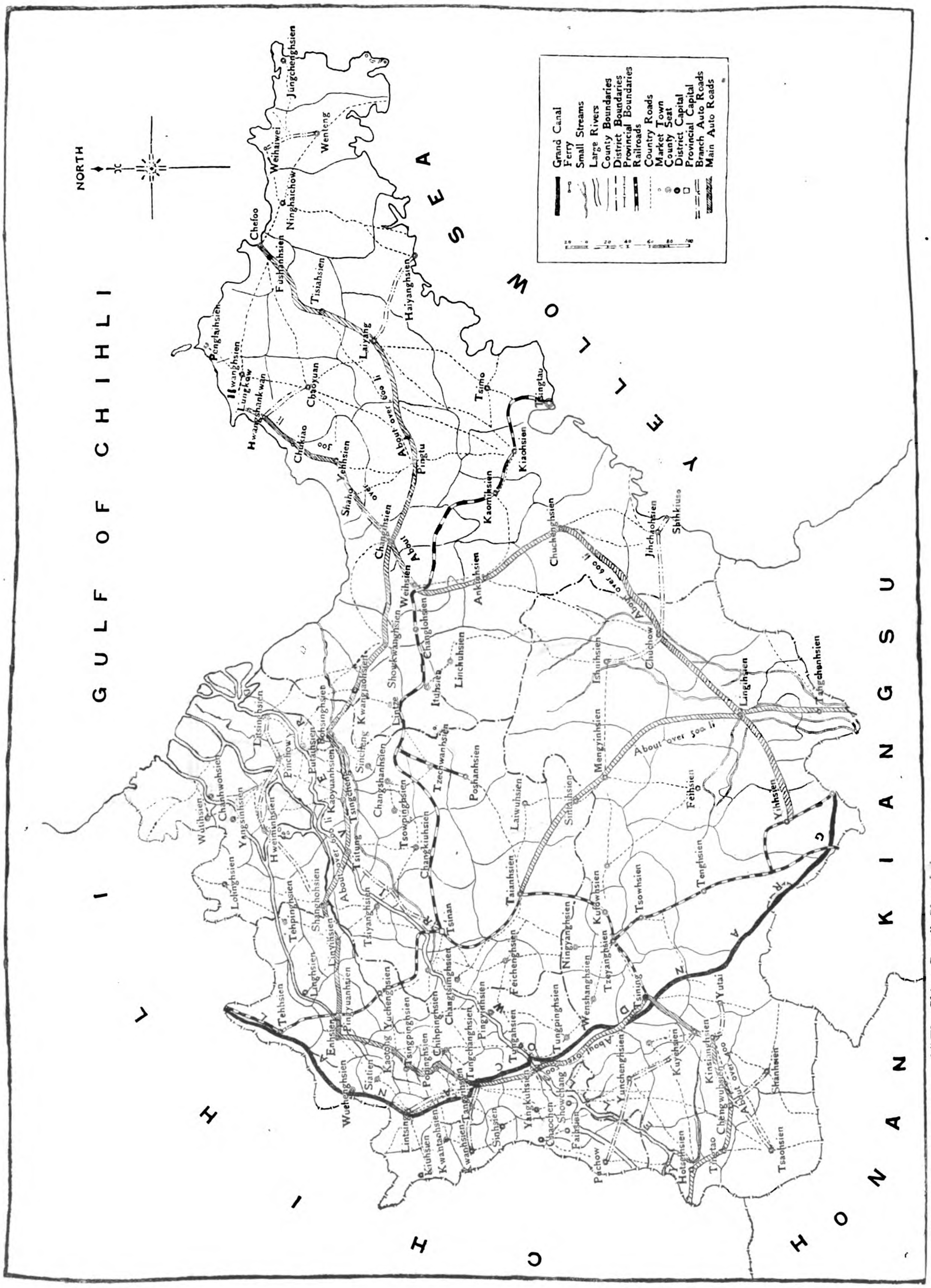
Red Cross Roads Constructed in North China

to Yang Chuan in fifteen minutes with a very bothersome mule and donkey pack traffic on the road.

"Transportation companies will undoubtedly be formed. However, the governor has forbidden the use of any but wide tired carts on the new road and the American red cross has been teaching the local wheelwrights how to make the best type."

Shantung Roads

Excepting the roads in the vicinity of Tsingtao commenced by the Germans and finished by the Japanese, the construction of good highways in this province is confined almost exclusively to those recently completed by the red cross engineers, and the Chefoo-Weihsien highway by the ministry of communications. It may be said that Tsingtao and the leased territory of Kiaochow is better supplied with modern roads than any other part of China. Only in Hongkong and Kowloon can one get such enjoyment in motor riding as in Tsingtao. These fine motor roads wind in and around the wooded hills, along the shore and batteries, by old German forts and out thirty miles into the country to Mount Laoshan or to the waterworks, a constant reminder of what other parts of China would be under efficient government. The total length of the streets and roads in the leased territory were doubled since the Japanese took over control in 1914. Within the municipal limits of Tsingtao the Germans laid 65,300 metres of macadam



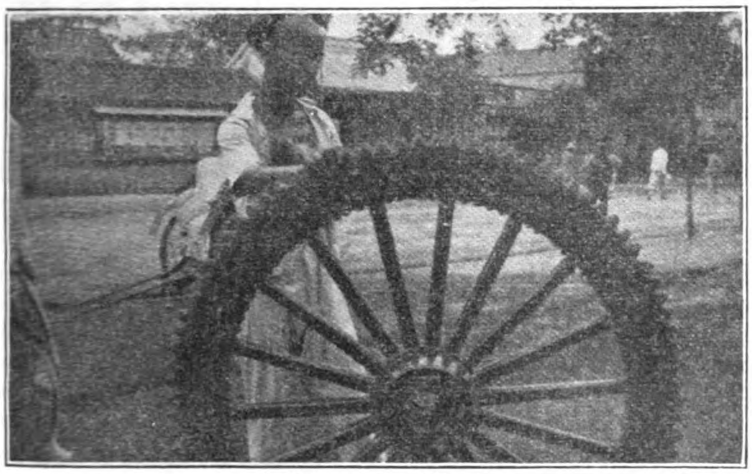
Map reproduced by courtesy of "The China Press," Shanghai.

Map Showing Contemplated Road Improvements in Shantung as Approved Last Year by the Provincial Government. Some of these roads were Subsequently Constructed by the Red Cross Engineers

and 3,400 metres of asphalt roads. To this the Japanese have added 27,290 metres of macadam and 13,300 metres of asphalt streets, while outside in the city in the leased territory the Japanese added 17,390 metres to the 27,290 metres of macadam roads completed by the Germans. In July last the Japanese authorities entered into a further contract for the extension of municipal macadamized streets in Tsingtao in the new industrial section, totaling approximately four miles.

The excellent work of the American red cross in building roads in this province has been described so often during the past year that repitition seems unnecessary. Sufficient to say that 485 miles of mud roads were built at a cost of $834,000 Mex., an average of $1,719 per mile. These roads are merely graded dirt, rolled or tamped firm. Macadamizing was out of the question because of the excessive cost of furnishing crushed stone. The scarcity of stone in these vast stretches of alluvial plain compelled the German engineers when building the northern section of the Tientsin-Pukow railway (which passes through the same districts as the main red cross roads) to erect great kilns to make brick from the excellent clay, which was afterwards broken to furnish ballast for the road bed. Mr. J. E. Baker, in charge of the red cross road-making operations, commenting on this, says:

"The standard width of these highways is 20-ft. If a centre crown 14-ft. wide were made of macadam 8-in. thick before rolling (which would mean about 6-in. thick after rolling), each lineal foot of highway would contain 9-13 cubic feet and a mile would require 49,280 cubic feet. At 100 pounds per cubic foot, each mile of macadam would amount to roughly 2,500 tons, or five train-loads or at the rate of seven trains per day for a year. In other words, the entire freight service of the Tientsin-Pukow line over the section in Shantung would be required for one year in order to macadamize the red cross roads.



A Chinese Road Devil

The saw tooth wheel of a swagger Peking Cart, the "bete noir" of the modern road maker

"Calculate the problem in a slightly different way. The rail haul upon this rock from the nearest source of supply to the railway stations from which it could be distributed would average 150 kilometres, and at the extremely low rate of four miles per ton kilometre, the freight would amount to 60 cents per ton, or $1,500 per mile. The mere railroad freight upon this rock would amount to $750,000 or not far short of the entire amount spent by the red cross on highway construction. But remember that this rock would then only be at the railroad and it would have to be carted an average distance of 300 *li* on either side of the railway. Assuming an average rate of 6 cents per ton per *li* for carting the rock from the railroad to the point where it is needed, and we arrive at the tremendous figure of $45,000 per mile for carting the rock to the point where it is to be put into place. There is no need of considering the cost of the rock or of putting it in place. Already the figure is over $22,500,000 for transporting the macadam for these 500 miles of highway. Perhaps as the macadamizing progressed, unit costs could be reduced, but only one-fourth of the area of Shantung would then be served by a mere skeleton of trunk lines. Ultimately, this is by no means an impossible task, but under the present financial condition, not only of the Chinese government, but of the Chinese people, such an expense is not to be contemplated. The situation in Shantung is typical of the situation in Chihli and of the whole coastal plain of China measuring several hundred miles broad and several more hundreds of miles long. If in this generation there are to be roads in China which will actually connect up provinces and serve the whole territory from Peking to Canton, some other factors must be brought into the question."

It is of supreme importance that manufacturers of road-making machinery keep Mr. Baker's statement always before them in estimating the possibility of finding a market for their products in eastern China. The character of the country compels the adoption of the rolled mud road, except in such short stretches in proximity to river beds where gravel may be obtained, or hills from which suitable stone may be quarried.

Over the Wuting-Yucheng section of the new red cross road in Shantung a company with $500,000 capital is being organized by Mr. Liu Ying-chang to operate a motor bus service: the distance is about fifty miles, while from Yuchen to Tungchangfu (fifty miles) another company capitalized for the same amount is being promoted by Mr. Pao Lien-shui. Both of these schemes have received the approval of the ministry of agriculture and commerce. Still another application has been made by Mr. Moh Fan-dong for permission to operate a motor bus service over the new road between Tsinanfu and Laokow. He has organized his company with $20,000 capital.

In addition to the Chefoo-Weihsien road constructed by the ministry of communications, a special bureau has been established at Chefoo for the construction of roads from the port to Weihaiwei, Laoyang and Haiyang respectively, a total of about 130 miles. This scheme has been formulated by the commissioner of customs at Chefoo and it is said that an appropriation of $240,000 will be made from the salt gabelle surplus for their construction. These three roads will complete the opening up of the rich hinterland behind Chefoo and bring greater prosperity to that port.

In the southern part of the province of Shantung a motor service was established on June 10 between Tsaochwang and Ichow a distance of about 50 miles. In the Kiaochow district the Koo-Tung Automobile Company has been organized in Tsingtao to build a road and operate an auto bus service between Lantsun and Tingtu.

Manchuria

Reference to the service bulletins of THE FAR EASTERN REVIEW for the past six months will give the reader a comprehensive idea about new roads and automobile companies in China. From Heilungkiang on the north to Canton and Yunnan on the south, from Shanghai on the east to Chengtu on the west, we hear of new roads, and streets being built and automobile and autobus companies organized. In the larger centres autobus companies have been active for a long time and each week brings news of new extensions. In the winter, the frozen plains and roads of Northern Manchuria permit of rapid traveling between Harbin and Tsitsihar and the towns on the Amur. In Harbin, the Russo-Asiatic Bank operates a motor-truck service for the handling of freight on the C.E. Railway and the streets of Dalny provide evidence in the shape of immense trucks employed by the S.M. Railway for the transport of bean cake and other commodities between the mills and the docks and warehouses. The road between Dairen and Port Arthur is being pushed through. Automobile companies are being organized for Antung and the Yalu valley.

The Antung District.—In Antung a Dutch engineer has been engaged to carry out the surveys for new city roads extending into the nearby country and an automobile company with $25,000

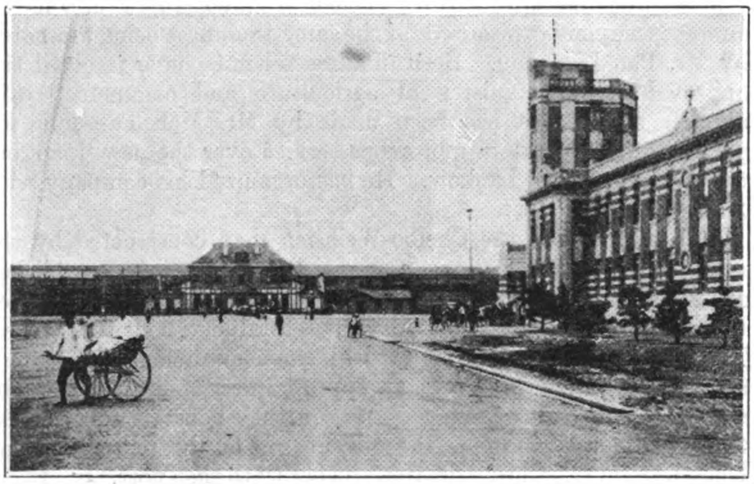
capital is being organized by Mr. Yang Ying-chong. Another enterprise called the Antung-Taikooshan Automobile Transportation Company has applied for permission to operate a service.

Native Roads Described

A general report on the roads of the Antung district was made last year by American Vice-Consul C. J. Spiker, which is typical of the other parts of North China. He says:

With the exception of the streets of Antung and of a few other cities, there are no highways worthy of the name in the Antung district, and no official or private projects for road construction, repair or maintenance, outside of the Japanese settlement in Antung. The roads in the rural sections are nothing but rocky trails or stream beds, passable only by the primitive, but exceedingly strong, native carts and pack animals. Passage of most of these roads by a four-wheeled vehicle would be an impossibility. Bridges are practically non-existent, the smaller streams being crossed by Fords, and the larger ones by means of crude ferries.

The roads are at their best during the winter months when the ground is frozen. After the spring thaw and during the rainy summer months the roads along the plains frequently become impassable quagmires or canals, in which four and five horse teams are frequently bogged and only extricated with great difficulty. In the winter months much of the cart and pack-train traffic is diverted to the broad stretches of the frozen Yalu and other rivers and streams of the district. The rivers can generally be used for cart traffic from the middle of December to the middle of February.



Streets in the Japanese Concession at Antung

A Street in Antung

Provisions for Maintenance of Roads

In very rare instances when, through flood or other cause, traffic becomes absolutely impossible over a stretch of country, the local officials levy a tax on the inhabitants of the locality in order to restore communication, but such action is resorted to only in extreme cases. As a general practice the roads in this district are maintained by the merchant guilds of the various localities, these guilds collecting subscriptions, disbursing the funds, and supervising the work, without any action whatever on the part of the local officials. The maintenance of the few bridges existent is usually provided for by the guilds that supervise the roads. These crude bridges are generally of very unstable construction, requiring the constant attention of caretakers, who generally exact a toll from those using the bridges. There is no government direction of construction and maintenance.

There is ordinarily no tax levied on abutting lands, the only tax money utilized for road construction being that levied by local officials in the rare emergencies referred to above. In the supervision of the roads under their "jurisdiction" the merchants' guilds assess guild members a small amount for road repairs, and also solicit subscriptions from the farmers and other members of the local community. There is no uniform method observed in the levying of such assessments and subscriptions, although in a general way it may be stated that the amount of subscription is based on the property holdings of the individual. Farmers frequently donate their labor in lieu of a cash subscription.

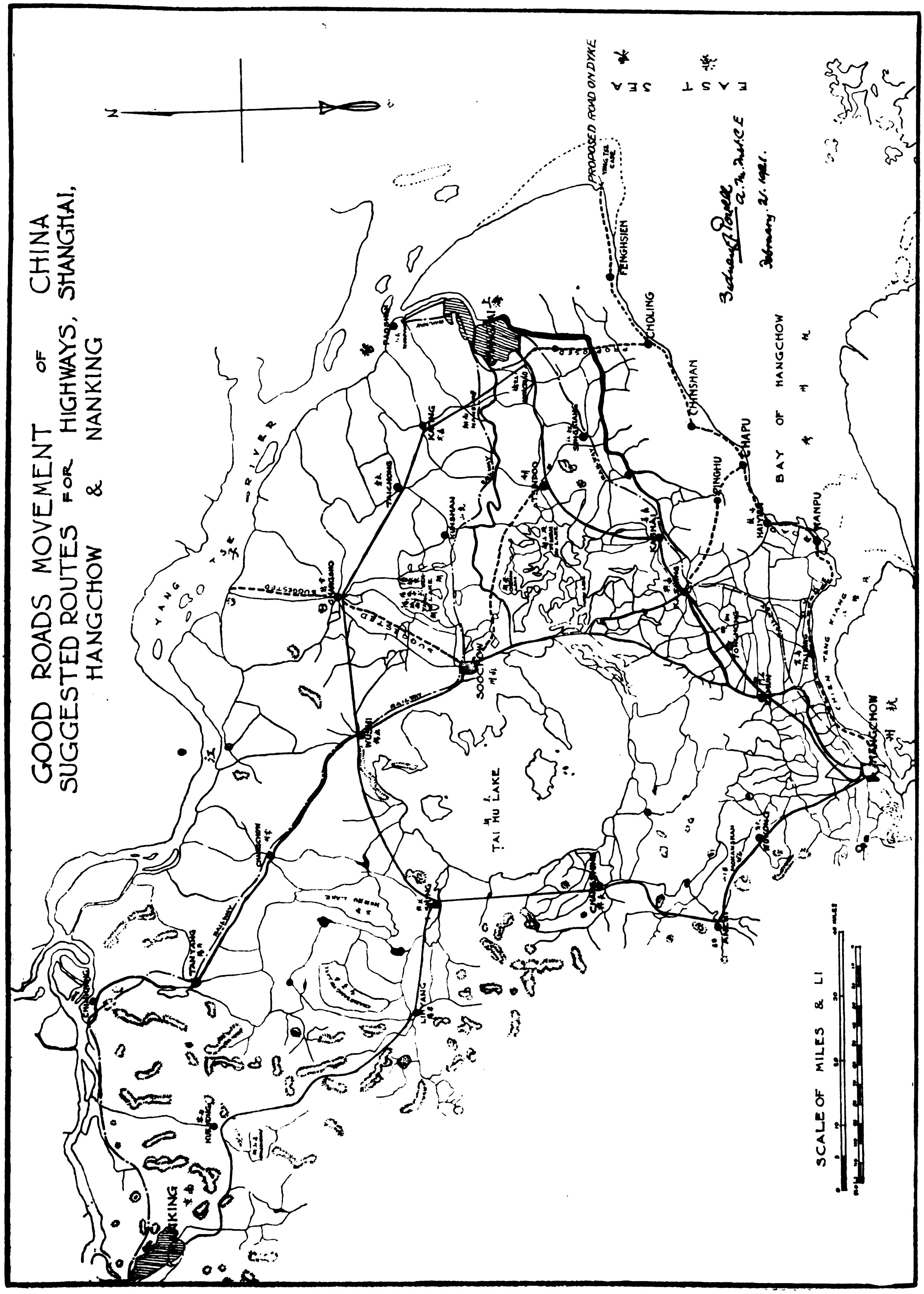
Cost of Hauling Freight

There is no fixed scale of charges for freighting between any two points, the price being a matter to be settled by bargaining on each occasion and depending upon the available supply of carts, the condition of the roads, the weather, political condition of the country to be traversed, character of freight to be carried, etc. Light, bulky freight, such as silk cocoons, pays an appreciably higher rate than heavy, compact freight, such as beans, kerosene, piece goods, and flour, the determining basis of charges apparently being the bulk earning capacity of the cart for "heavy" as opposed to "light" freight.

The average charge per day for the service of a 2-horse cart in hauling freight in the Antung district is $4.68 United States currency ; the maximum load is 1,066 pounds, and the average day's journey is 40 miles. The charge for a 3-horse cart is $5,61, the maximum load is 1,600 pounds, and the average journey is 30 miles. The services of a 4-horse cart for one day cost $7.01, and the maximum load is 2,133 pounds, over an average distance of 30 miles. For a 5-horse cart the rate is about $9.35, the maximum load 2,666 pounds, and the average day's journey 30 miles. The cost per ton-mile in each instance is from $0.24½ to $0.26. These charges are based on rates quoted by firms engaged in overland freighting. The average haul is computed on a daily basis. But when the roads to be traversed are above average and the route lies through a region free from robber bands a flat rate for the trip is sometimes made. It is to be particularly noted that the above prices are calculated at the present rate of exchange, i.e., $1 gold equals local small coin $1.068, or at the rate of $1 gold for $0.93 Mexican.

Cost of Carts, Draft Animals, Etc.

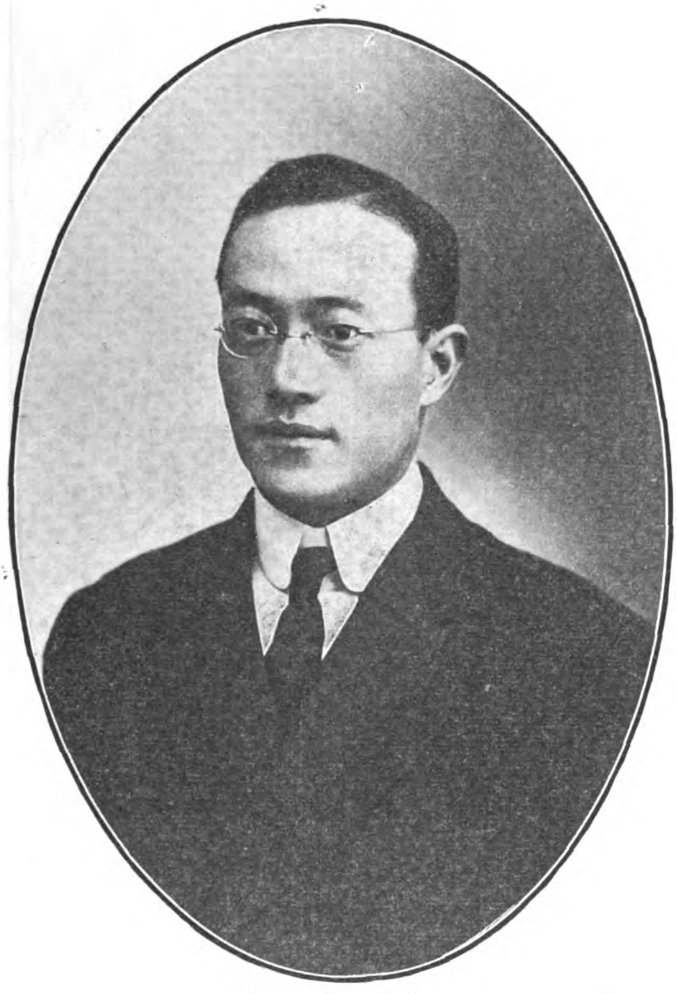
There are no motor vehicles whatever used in freight transportation in this district and there are only three passenger automobiles in Antung. All overland hauling is done by means of the native carts, or by pack train. The carts, which are without springs or covering, are very strongly made, and seem admirably adapted to withstand the exceedingly rough usage to which vehicles are subjected. A large cart costs the equivalent of $140 gold. Teams consisting of two to seven draft animals are used to draw freight carts, the number of animals varying with the load carried. The team in most common use consists of four or five animals, horses, mules, donkeys and bullocks being used for this purpose. A team in which a mule, a donkey, a bullock and two horses are hitched to the same cart is a common sight in this region. Although there


GOOD ROADS MOVEMENT OF CHINA
SUGGESTED ROUTES FOR HIGHWAYS, SHANGHAI,
HANGCHOW & NANKING
SCALE OF MILES & LI
PROPOSED ROAD ON DYKE
EAST SEA
BAY OF HANGCHOW
TAI HU LAKE
YANG TSE RIVER
SOOCHOW
HANGCHOW
WUSIH
CHINSHAN
CHAPU
KANPU
HAIYEN
PINGHU
KASHING
FENGHSIEN
CHOLING

is a wide range in prices, the following are average gold prices for draft animals at present exchange rates: Horse, $90; mule, $75; bullock, $38 and donkey, $14. The average daily wage of a cart driver is 50 cents "small coin" ($0.47 gold) plus the cost of food and lodging.

Number of Carts Available for Transport

The total number of carts of all varieties in use in Antung city approximate 1,000, but of this number only 50 are used for rural long-distance freight hauling. Within Antung city, most of the local freight hauling is done by means of small hand-drawn carts and wheelbarrows. One vehicle in very common use is the "*p'ing ch'e*," a small two-wheel cart with a carrying capacity of about 800 pounds. These carts, of which it is estimated there are 700 in Antung, are usually drawn by a man and donkey, hitched tandem, the man being placed in the shafts. While there are no figures upon which even a very rough estimate of the number of freight-carrying carts in this district can be based, local Chinese have stated that there are perhaps 2,000 large horse-drawn carts in the 18,000 square miles of this district, with three times that number of other freight and passenger vehicles.



Dr. C. T. WANG,
Chairman of the Good Roads Movement

Shanghai Region

Great activity is seen in the Shanghai region under the stimulus of the goods roads movement and its energetic president, Dr. C. T. Wang, who has retired from political life to devote himself to business and development work. The map of Kiangsu herewith presented, will give some idea of the comprehensive system of provincial and local roads projected or in course of construction. In addition, there are many secondary roads such as one from Pootung to Nanhui near the Yangtze cape, which will continue westward and connect with the dyke road shown on Mr. Powell's map. When this system of new roads is completed, Shanghai will have direct auto connection with Nanking on the north, and through Kashing and Huchow to the Anhwei border or the west where the road will merge into the Anhwei provincial system and carry on to Wuhu. The road through Hangchow into Chekiang is to be extended south into Fukien and westwards into Kiangsi.

The Good Roads Movement.—This was largely the conception of Dr. C. T. Wang and was organized first as a committee of the Pan-Pacific Association with Dr. C. T. Wang as chairman and Mr. George E. Sokolsky of the government bureau of economic information as secretary. The following were elected to serve on the executive committee: Mr. W. W. Lockwood, Dr. F. C. Tong, Mr. Yung Chung-ching, Dr. P. W. Kuo, Mr. Chao Ching-hua, Mr. Bernard Firth, Dr. T. K. M. Siao, Mr. Sidney Powell, Mr. C. C. Nieh, Judge J. Ross, Miss Gretchen Fitkin, Mr. Allen Loehr and Lieut.-Col. M. H. Logan.

At the outset it was found that the greatest impediment to the building of good roads was the ignorance of the people and the unwillingness of the officials to spend money. The committee therefore decided upon a course of educational work among the masses. This sort of activity is not spectacular and results cannot be seen immediately. But it can be said that it was largely as a result of the discussion with regard to good roads which this organization started in the Chinese press that a number of private companies were formed in the vicinity of Shanghai to build roads and run motor bus lines to cities along Hangchow Bay and the Whangpoo River which are ordinarily not reached by the railroad. Plans are under way to build such roads to Chapoo, Minhong and other cities.

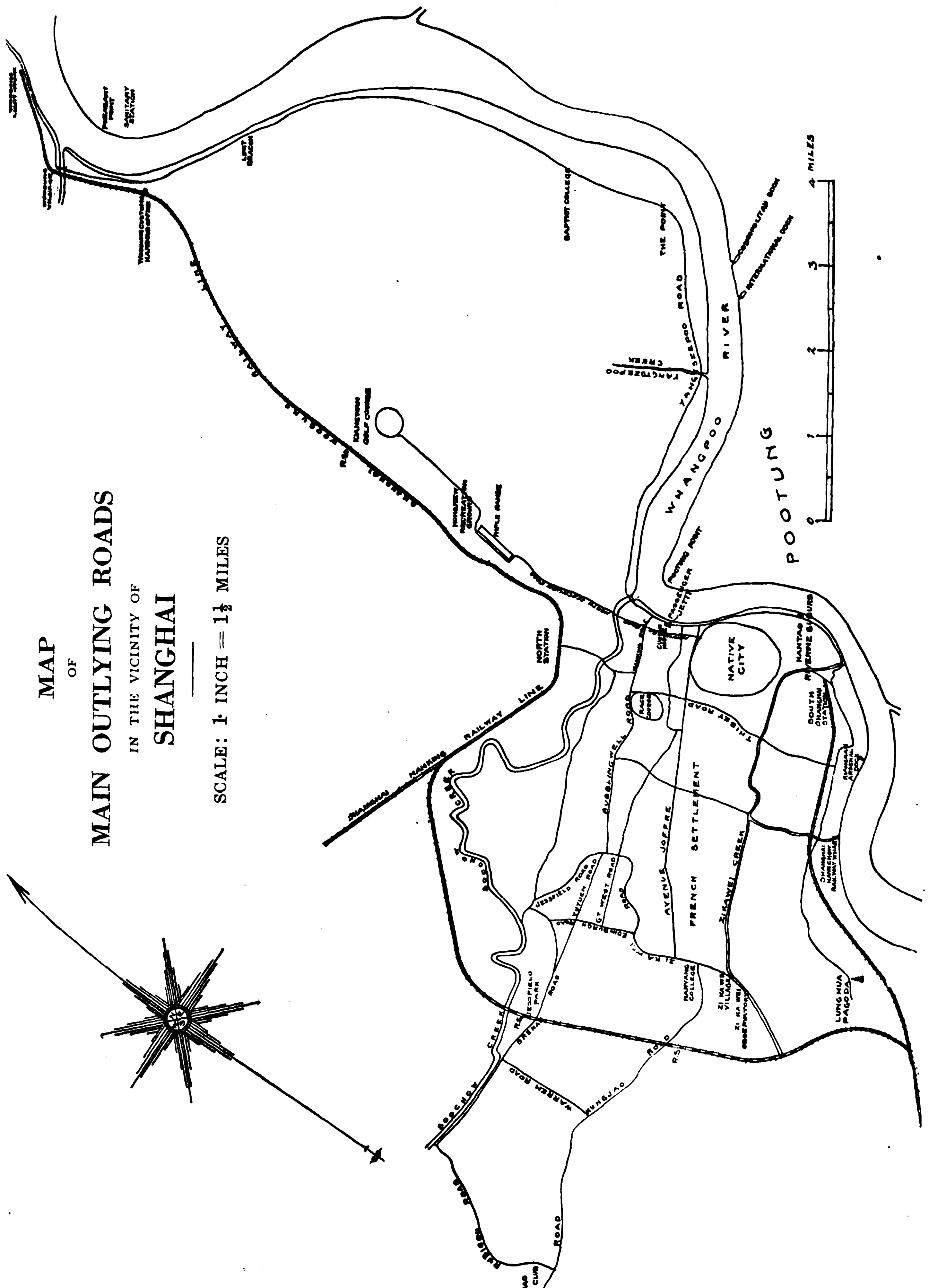
The goods roads movement has also been able to obtain a promise from General Lu Yung-hsiang that he would permit the employment of troops under his control for the building of roads in Chekiang province and in those districts of Kiangsu province which are under the control of his military officers. The road building bureau of Chekiang province had worked out a scheme for the building of roads from Hangchow in every direction to the borders of the province. One of these roads will become the basis of the road from Shanghai to Hangchow.

Under the direction of Mr. Sidney J. Powell, a plan has been worked out for the building of a road from Shanghai to Hangchow and another from Shanghai to Nanking. The good roads movement of China does not propose to build these roads. Its aim is to stimulate an interest in them; to educate the Chinese along the route to favor the road and to get the officials concerned to approve of it. The governors of both Chekiang and Kiangsu provinces have written to the movement in support of the roads planned and offering to give their assistance. There can be little doubt that the road from Shanghai to Hangchow is a matter of the near future.

The work of the movement was in the hands of a sino-foreign committee, which for various reasons did not produce visible results. One reason was that until recently no charter was obtainable from the government. Another was the newness of the work and the fact that the organization was feeling its way. Now, however, Chinese have shown a greater interest in the good roads movement and are contributing large sums of money to its support. It is hoped that the foreign end of the work will shortly be re-organized, in co-operation with automobile dealers and that results will soon be produced.

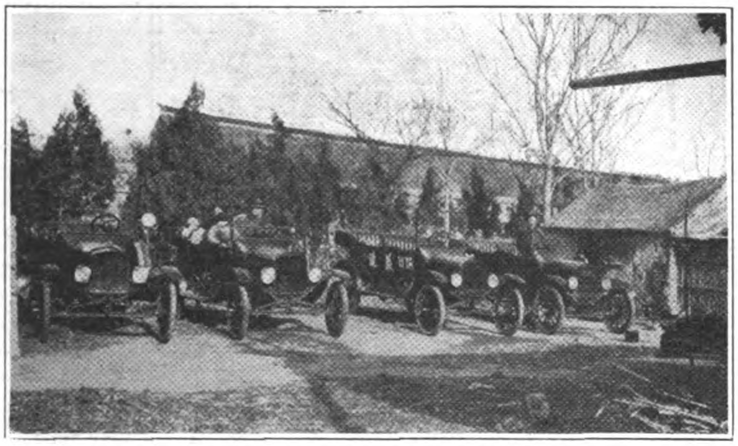
At present the good roads movement is organizing solely in Shanghai. But the movement is national in scope and plans to organize branches in every province.

Kiangsu Roads.—The projected Kiangsu road system radiating from Shanghai seems assured of success. Several companies have been formed or are in process of promotion with sufficient capital to undertake their construction and purchase the required equipment. The Chekiang and Kiangsu provincial military and

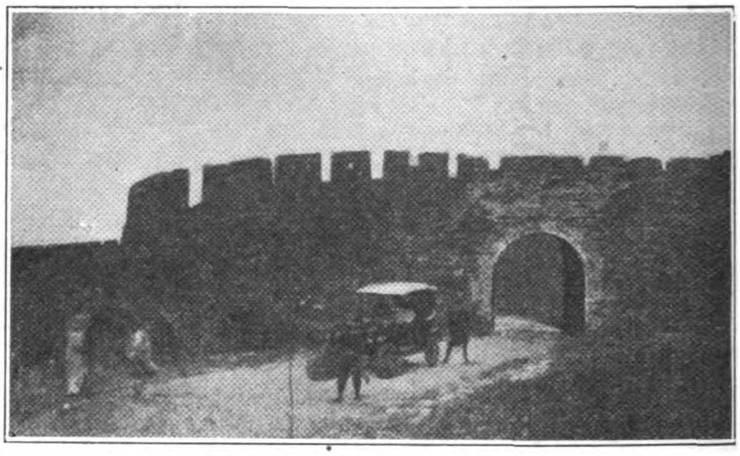


MAP
OF
MAIN OUTLYING ROADS
IN THE VICINITY OF
SHANGHAI
SCALE: 1 INCH = 1½ MILES
WHANGPOO RIVER
POOTUNG
NATIVE CITY
FRENCH SETTLEMENT
AVENUE JOFFRE
ZIKAWEI CREEK
BUBBLING WELL ROAD
JESSFIELD ROAD
JESSFIELD PARK
NORTH STATION
SHANGHAI NANKING RAILWAY LINE
YANGTSZEPOO ROAD
YANGTSZEPOO CREEK
THE POINT
POOTUNG POINT
NANTAO
SOUTH STATION
LUNGHUA PAGODA
SOOCHOW CREEK
WARREN ROAD
HUNGJAO ROAD
ZI KA WEI VILLAGE
NANYANG COLLEGE
4 MILES

civil authorities are also taking a keen interest in the program advocated by Dr. C. T. Wang and have promised assistance in surveys if not in money. For the practical execution of the Kiangsu road program, the Shanghai-Taichong Automobile Transportation Company has been organized to operate between Shanghai and Taichong, an approximate distance of 25 miles. This company started operating a service over the first ten miles of completed road between Shanghai and Lutien on January 1st, with five new American busses and several autos. In connection with the Shanghai-Taichong road there has been organized another enterprise called the Changsho-Taichong-Shanghai Automobile Transportation Company with a capital of $500,000 which will take up the work from Taichong and carry it on 25 miles further to Changsho. It will operate its autobus service in connection with the Shanghai-Taichong Company in order to give through service. Another large company known as the Soochow-Kashing-Huchow Automobile Transportation Company is in process of promotion and will take up the work at Taichong and carry it on through Quinsan to the provincial capital at Soochow, an approximate distance of 30 miles. This section will be the first to be built so as to connect with the first mentioned company and provide through traffic between Soochow and Shanghai. The second section of this ambitious enterprise will connect Soochow with Kashing and thence proceed westward to Huchow, another 85 miles, and thence on another 35 miles to Kwanteh in order to connect with the Anhwei provincial road system. Another section will strike north from Soochow passing through Changzao to the Yangtze River, while still another route shown on Mr. Powell's map will strike southeast from Kashing and pass through Pinghu, terminating at Chapu on Hangchow Bay and the proposed dyke road. This is the most ambitious program in this section of China and if carried out will place Shanghai in connection with other provincial systems and permit of through traffic into districts that will not be opened up by the railway for another 20 years, if ever. The company has been organized under the direction of Mr. Chen Hui-yu with a capital of $3,000,000 the shares to be issued through the Sino-Foreign Trust Company. The entire scheme embraces about 250 miles of new roads. This Company evidently intends to absorb some of the minor concerns such as the Sean-Kwanteh Motor Road Company organized in April last to build a road and operate a motor service between Sean in Chekiang and Kwanteh in Anhwei at a cost of $300,000. This is the western section of the Huchow-Kwanteh highway embraced in the larger scheme.



A Flock of Fords operating in North Kiangsu



Ford Car near City Gate, Nanking

The importance of the central Kiangsu scheme will be better appreciated when considered in relation with others in contiguous territory. For instance, on the north, once the new roads reach the Yangtze at Chinkiang, they will connect across the river at Kwachow with the North Kiangsu scheme. A company was organized in May last with $180,000 capital to build roads in that vicinity, the chief one to connect the river port with Yangchow. This is expected to be completed this year. The main road will then proceed north towards Tsingkiangpu and branch to Hsuchow and Haichow. The first section will connect with a local system of roads projected by the energetic Chang Chien and his associates connecting Yangchow with Nantungchow, at an estimated cost of $150,000, capital for which was subscribed last June.

Nantungchow.—This "model city," the creation of Mr. Chang Chien, located on the north bank of the Yangtze near its mouth may be said to be the "Dayton" of China, a city owing its inception, development and prosperity to the public spirit of its principal capitalist. The development of this town merits a book by itself, as here are found all up-do-date improvements, with libraries, schools, hospitals, museums, public park, prison, theatres, moving pictures, cotton mills, oil mills, match factory, flour mill, silk filature, iron works, electric light plant, banks and the other accessories to a modern business community, all on Chinese lines. It has its own steamer service with Shanghai, and to connect with the river port at Lu Ching King six miles away, there has been established a motor bus service, with cars supplied by the Central Garage of Shanghai. The first of these buses were built on Republic chassis of 1½-2-ton capacity. These have been supplemented by others built on Garford and Dennis chassis. In addition, another service is in operation connecting the city with Lan Shan, a popular resort, distant five miles.

Nanking Roads

The Nanking authorities are also in line with a plan for the construction of four roads in this district: Tantu and Tanyang to Nanking; Chuyung, Kingtan to Nanking; Kusui, Liyang, Kuatsung to Nanking and Kiangpu, Luho to Nanking. New roads are also being built in Nanking and its immediate vicinity. The improvement of the highway from the Chao-Yang gate to Tang Shui, a popular resort where hot springs are located, about twenty or more miles from the city, is going on. The new road is to be twenty-five feet wide and that will make it possible for automobiles and carriages, as well as ricshaws, to go out to that interesting spot.

There are about 40 cars in Nanking, mostly owned by Chinese, with one hire garage operating six cars. The motor road around the walls of the city is about 30 miles long with another good road to the Ming Tombs and Purple Mountain. A company was organized in June last to build the road from Changchow to Hsiaowutseng in this section of Kiangsu, and still another in November to build a road from Changchoo to Wangling distant about 10 miles, at a cost of $30,000.

North Kiangsu Roads.—The merchants of North Kiangsu operating on their own initiative have organized the North Long Distance Automobile Service Company, which is now partly in operation carrying passengers between Hsuchow and points

eastward towards Susien on the Grand Canal. This company has purchased several machines from the Shanghai agent of the Ford company.

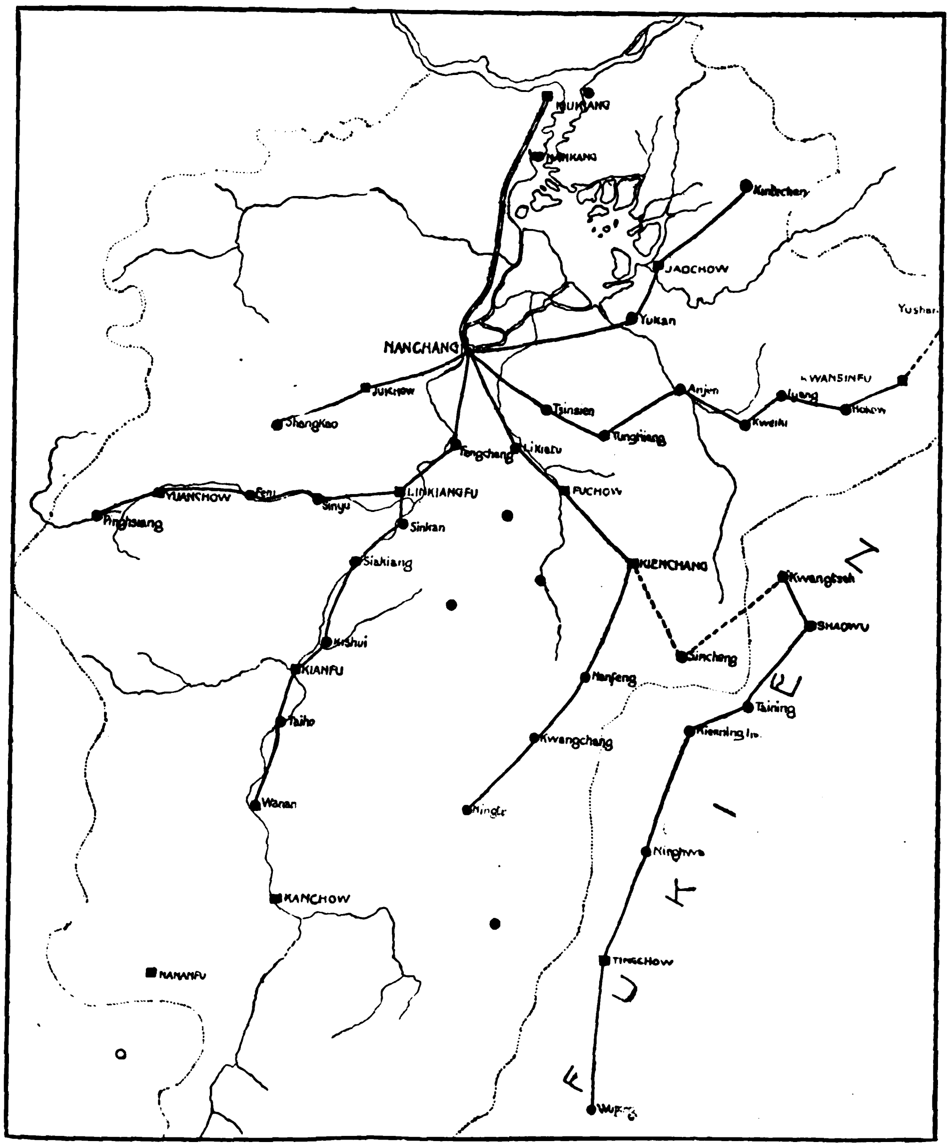
There is also the Lee Hua Company and the Yue Kong Transportation Company organized at Hsuchow each with $100,000 capital now operating in Northern Kiangsu and another company promoted recently to build a road in Northern Anhwei to connect Pengpu on the Tientsin-Pukow Railway with the town of Hweiyuan.

Chekiang Roads.—To the south of Shanghai, the Kiangsu system will connect with the roads building or projected by the Chekiang provincial roads bureau.

We have no complete data as to the entire road program of this province, but there are several important roads now under consideration, notably one running west from the provincial capital at Hangchow towards Yuhang, the first section of an inter-provincial road to Hweichow in Anhwei mentioned above. Another important road in Chekiang to be constructed by the provincial authorities will start in the Sin Chong Kwan Mountains and follow down the Yen Ki Valley through Chen Hsien to Shangyu, a distance of 170 miles, and is estimated to cost $1,000,000. An automobile company is to be organized to operate a service along this line. A short road is to be constructed from Ningpo south to Fenghua for operating a motor bus service. This road will be only twelve miles long, but will prove a highly profitable investment, while still another automobile road will connect Ningpo with Chinhai and Szechee.

The estimates of the Hangchow-Yuhang Motor Road and Transportation Company will give a general idea of the cost attached to these roads.

(1) Construction of the road from Kwan-ying-jao in Hangchow to Shan-tao-lung, Yuehong, measuring 50 Chinese *li*; costs $195,000 including land price, bridges and sluices, pebbles and lime, an average cost of $3,900 for one *li*; (2) $75,600 will be devoted to purchase of automobiles: 8 3-ton passenger auto-buses each capable of accommodating 24 persons, for Tls. 40,000 at Tls. 5,000 each, 4 cargo buses for Tls. 10,000 at Tls. 2,500 each and 2 common buses for Tls. 4,000 at Tls. 2,000 each; (3) six stations at $1,000 each $6,000, general office and car sheds, $4,000, making a total of $10,000; (4) $10,000 is to be spent in purchasing furniture, fixtures and office equipment and appliance; (5) $9,400 is to be set aside for meeting the office expenses.



Proposed Roads in Kiangsi Province

It is estimated that the yearly income will be about $144,000 with a yearly expenditure of $129,980 (this includes dividends), leaving a surplus of $14,020.

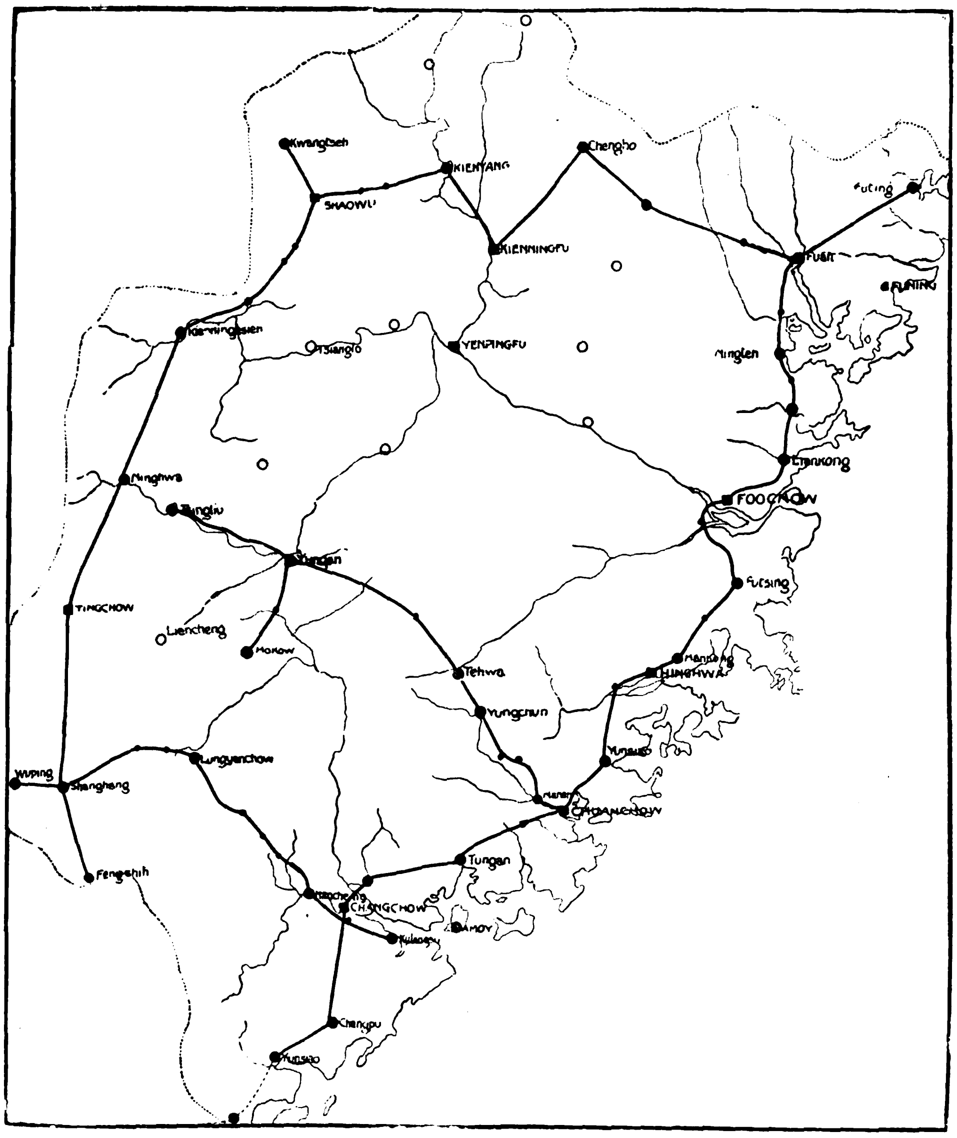
In this estimate, it will be seen that the cost includes land, bridges, etc.

Kiangsi Roads.—It will be some time perhaps before the Kiangsu highway system radiating from Shanghai, is carried through into Chekiang and Anhwei to the Kiangsi border, but once this connection is established, we link up with another comprehensive provincial system which carries us on towards Hunan and south to the Kwangtung border. The province of Kiangsi with its capital at Nanchang is the strategical key to the rest of South China commanding all the lines and routes to the east and south. The provincial road scheme embraces a total of 1,200 miles, estimated to cost an average of $3,000 per mile and five years to construct. The first and most important of these roads is naturally the one which passes through the richest agricultural and mining districts in the Kan River Valley. This road will link Nanchang with Kanchow passing through the important towns of Fencheng, Linkiang, Sinkan, Siakiang, Kianfu, Taiho and Wanan. The second line will branch off the Kan River road at Linkiang to connect with Pinghsiang. The third will run east from Nanchang to Kwangsinfu near the Chekiang border and here link up eventually with the Chekiang highways. The fourth will start at Nanchang and run up the Fu River Valley to Fuchow, thence to Kienchangfu and then to Ningtu in southeastern Kiangsi. At Kienchangfu, another branch will ultimately connect with the Fukien provincial road system and carry on down the Min River to Foochow on the coast. The fifth road will start at Nanchang and end at the great pottery centre at Kintechen, passing through Yukan and Jaochowfu, a highway that will ultimately form one of the principal sections on the main road west from Shanghai. The sixth highway will proceed from Nanchang up the Kin River valley through the important city of Juichowfu and terminate at Shangkao. Here we have a comprehensive system, which taken with the Anhwei, Chekiang and Kiangsu systems will bring through road transportation into the province of Hunan.

Fukien Roads.—Turning once more to the south of Chekiang, we find the Fukien provincial authorities also preparing elaborate plans for a comprehensive system of provincial highways which

embraces five main roads. The first of these, called the Fukien eastern or coast road is an important engineering project, necessitating many long and expensive bridges across the lower reaches of the rivers which abound in this province. Starting in the northeast corner of the province at Futing this road will pass through Fuan, Ningteh, Loyuan, Lienkong, thence to the provincial capital at Foochow and then southwards along the coast through Futsing, Hinghwafu, Hweian, Tungan, Changtai and Changchowfu terminating in the southeast corner at Yunsiao, a total distance of about 350 miles. The Fukien western road will commence at Fengshi and pass through Shanghang, Tingchow, Ningwa, Kienninghsien, Taining, Shaowufu and end at Kwangtseh on the Kiangsi border. Here it will ultimately connect with the Fu Valley road of the Kiangsi system. The length of this road is about 180 miles. The Fukien central road will start at Nanan on the coast road and pass through Tehhua, Yungan, Tsingliu and end at Hokow, a distance of about 140 miles. The Fukien southern road will start at Haiteng passing through Nantsing, Lungyen and Shang-hang, terminating at Wuping, a distance of 140 miles. The Fukien northern road will start at Fuan on the coast road and proceed west through Chengho, to Kienningfu, thence to Kienyangfu and terminate at Shaowufu, a distance of about 180 miles. Here we have a provincial system aggregating 1,000 miles of main highways estimated to cost about $10,800 (Mexican) per mile or a total of $10,800,000, a task well within the financial limits of the provincial capitalists. The Fukienese have already started to build macadam roads leading out from the important port of Chuanchow to Yungchun and between Huyang and Tehua for a motor bus and freight traffic, while a company was organized last June with a capital of $1,000,000 to construct the highway between Amoy and Foochow and operate a motor service. This road would be about 140 miles long.

In the vicinity of Foochow over 30 miles of macadam roads have been built by the Foochow road bureau, headed by Mr. Lin Ping-chan, the representative of the Chinese government on the Min River conservancy commission. The cost of these roads was $325,484 (Mexican), or an average of $10,636 per mile. A motor passenger and freight service is maintained by the Yen Fu Chuan Company, a semi-official concern in which the provincial government holds a large block of stock. This company is operating six motor cars and seven buses on three regular routes. It holds the monopoly right to build roads and operate motor bus services from the capital to Yenpingfu and from the capital to Chuanchow. The projected road to Yenping up the valley of the Min River, about 100 miles long, is undoubtedly one of the most important in all China as down this route comes the great commerce from the interior, and while such a road could not hope to compete with the cheaper river transportation, it will materially shorten distances by the saving in time. The Foochow-Chuanchow road has been made part of the provincial coast road plan, as outlined above.



Proposed Road Scheme for Fukien Province

Our correspondent in Fukien, describing the progress of the province, says that one remarkable advance at Foochow has been the opening of the horse road from the end of the long bridge (Wan-shou Ch'iao) to the city, and on into the heart of the city. This shows how thoroughly the old bondage to *feng shuei* is broken. The south gate was the dragon's mouth, and the white pagoda on the east and the black pagoda on the west were the dragon's horns. The ground in and about the south gate was so low that in case of a flood in the river it would be overflowed to a depth of one to five or even to ten feet.

The horse road was begun in the fourth year of the republic and was finished in the seventh. It first turned east from the head of the long bridge till it reached the outside of the suburbs, then pursued a general northerly course for about two miles, then turned west till it reached the water gate by which it entered the city.

From this point it was extended into various parts of the city. It was finished in the seventh year of the republic, was soon well supplied with rickshaws, and much patronized by the well-to-do. But all foot travel between the city, the south suburbs and the foreign community went by the shorter south street; and then this also was opened to the horse road. A gap was made right through the city wall on the east side of the south gate, the low ground in and about which was filled up till the gate was closed to all travel. The shops facing on the street retracted their fronts to make a street wide enough for three autos to go abreast; and now horse carriages and autobusses dash along the once sacred south street. The rickshaws also run out through the west gate up to the Upper Bridge (Yun-shan ch'iao); and in time they will be running down the river to the anchorage.

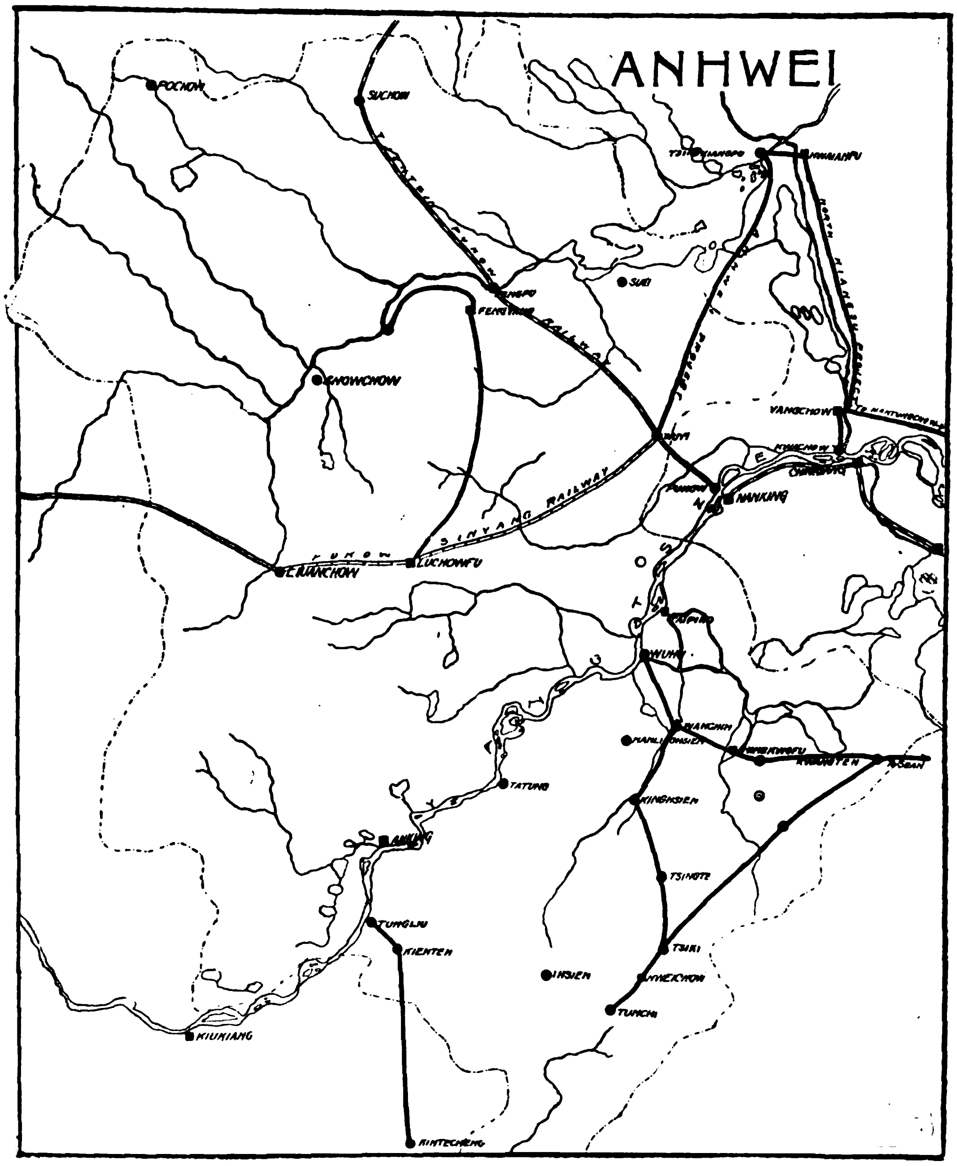
There is talk of a highway to extend clear across the province to the head waters of the Min, and then from there over the divide

into the Kiangsi province. This will come when the country is united again under one good government. The influence of the waterworks, electric lighting and widened streets is felt all through the Min Valley; and beginnings along these lines have appeared at various points in the interior. The whole province is rich in water power, now all running to waste. But the old superstitions are breaking down; and the people are ready. All now waits on capital; and capital waits for confidence in an established government acceptable to the people.

Hinghwafu.—Hinghwa is also to be made the centre of a system of country roads radiating in all directions and making connections with the sea-port and the principal cities of this region. Already certain taxes are specified for the carrying out of the project. The scheme contemplates the construction of about a hundred miles of road and if carried out will be of great value to this section.

In Yungshun, a broad street thirty feet in width was built through the chief business centre of the city requiring the pulling down of a strip of shops ten feet wide on either side of the former street. The road in Yungshun has been built on into the country until ten or fifteen miles have been completed.

Changchowfu.—In this city the Sze Shun Automobile Transportation Co. has been organized to run a service on the newly-built provincial roads and also on roads being built. Changchow will be chosen as the central station, leading to Shihma on the southeast, a distance of 35 *li*; to Tienpaohsu on the northwest to Nanchinghsien, 35 *li*, and to Nanhsu on the north then turning eastward to Changtaihsien, 30 *li*, aggregating 100 *li* in length. Transportation service from Changchow to Makowjao via Fengjenmue, a distance of 35 *li* and from Fengjenmue to Chenchee, 10 *li*, is also under contemplation.



Some Proposed Roads in Anhwei Province

Some of these roads are merely local sections of the provincial scheme. From the southern terminus of the Fukien coast road at Yunsiao another highway is now under construction that will carry it down into Kwangtung through Chaochowfu to Waichow, where it will link up with the road to Canton. Part of this road has been completed and opened to traffic.

Anhwei Roads.—The road program for this province is not so elaborate perhaps as some of the other more important sections of China, but such as it is, it will open up some of the most prosperous districts of China and in connecting with the Kiangsu system will bring communication with Shanghai and neighboring provinces. The plan as passed by the provincial assembly provides for the present of four main roads on which motor services will be operated. These roads will connect Wuhu with Tunchi, Tungliu with Kintechen in Kiangsi, Hueichow with Sean in Chekiang and Wuyi with Tsingkiangpu in Kiangsu.

The Nanyang Brothers Tobacco Company at Liufuzi in the Fenyang district will build an automobile road from Mentaitze to Liufuzi and, if the necessary funds can be raised, the road will be extended to the city of Luchow.

Hankow

Hankow probably presents the best picture of motor traffic possibilities stifled by Chinese obstruction and apathy. With only twenty-five miles of roadway, including cross streets, and of which 20 miles are located in the foreign concessions, this port has 172 licensed passenger cars, which include five motor trucks, two of which belong to the Chinese post office. In 1912 there were three cars, while in 1920, 47 cars were imported valued at $67,202. Notwithstanding the restricted mileage of streets the use of cars is becoming more and more extended, but no great development can be expected until further road additions are made. Across the river is located the large city of Wuchang, the capital of the Liang Hu, or the two great provinces of Hupeh and Hunan, next to Tientsin the most important government seat in China. Yes because of the lack of roads, the immensely wealthy Chinese officials have as yet purchased no cars. The same is evident in the neighboring city of Hanyang. Not a car or a truck to be seen. While all other important provinces in China are devoting some study to the planning and construction of roads, the Liang Hu government has ignored to date this most essential step in the development of its resources.

Modern Road at Woosung

Owing to favorable weather, the construction work on the new road along the Woosung Creek, Woosung, under the auspices of the Woosung port works bureau, has made rapid progress and the first section completed before the time limit. At the sides of the newly built road trees will be planted.

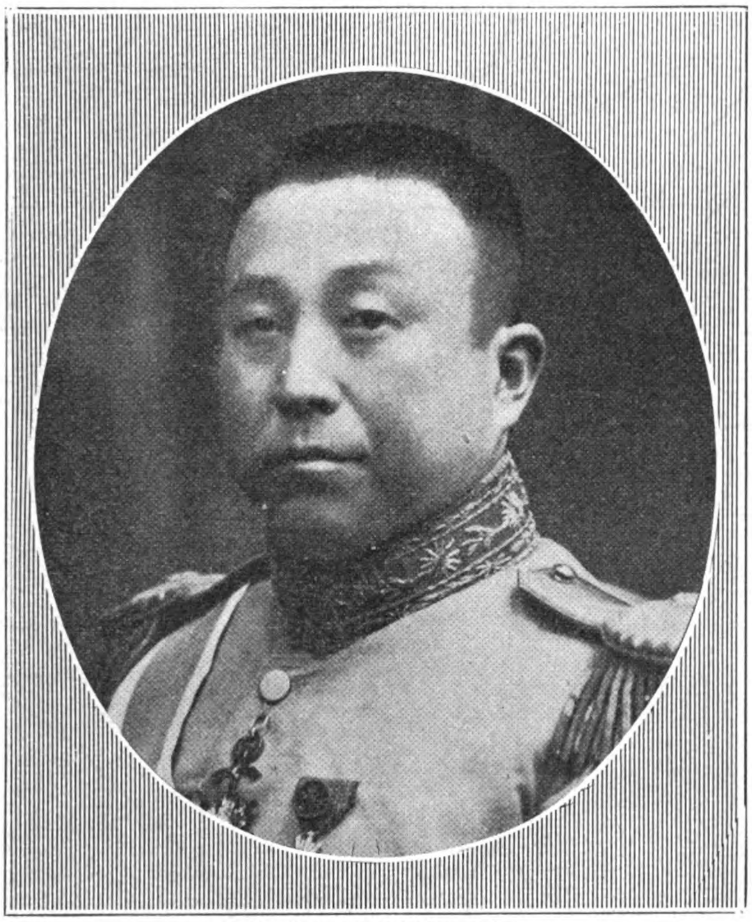
A Modern Chinese Road and Transportation Company

The Shanghai-Minhong-Choling Automobile Transportation Co., Ltd.

AT the present there are four road and automobile companies organized for operating out of Shanghai. The first of these, The Shanghai-Taichong Automobile Transportation Company, with general offices at Tai Teh Lee on Carter Road, under the management of Mr. Hung Pey-yen, commenced operations on January 1, on a thirty *li* (ten miles) section between Chapei and Lutien. This service has five new American buses accommodating 10 first and 16 second-class passengers, which cost Tls. 4,500 each. As the road is extended, additional cars will be added. There is also the Shanghai-Nanhui and the Shanghai-Chuensha Automobile Transportation Companies, with offices at Tsing Yuen Lee on Peking Road, jointly managed by Mr. Mo Sze-chai. The latest progress reports of these roads state that after two months of work on the Shanghai-Nanwei automobile road, the section from Chowchair-doo to San-ling-dong has been completed and it is generally believed that at the end of the year the road will reach Chow-poo. Work on the two cement bridges known as Hungdah-jao and Sun-chiar-jao has been started. It is expected that service between Chowchiar-doo and San-ling-dong will be inaugurated within the year, while through traffic on the whole line will be possible by the end of April, 1922.

With regard to the automobile road from Shanghai to Chuensha, great progress is also being made in construction work. The capital of the Company has been fully subscribed and surveying from Ching-ningsze to Yee-chiar-jao completed. Work on two large cement bridges named Mar-chair-pang-jao and Dao-kiu-jao, will soon commence and are expected to be finished next March. The road will have a width of 40-ft. except at the most prosperous section from Ching-ning-sze to King-chiar-jao where it will be 50-ft. wide.

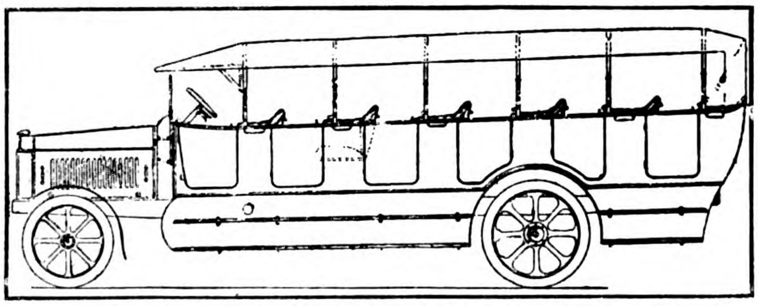
Full particulars regarding the capitalization and estimates of these three companies are not as yet available but we may take as typical of the many new road and auto transportation companies operating, projected or in process of promotion in China, the Shanghai-Minhong-Nanhui-Choling Automobile Transportation Company, Ltd., organized in Shanghai and registered with the ministry of agriculture and commerce in Peking, and at present actively engaged in pushing through its construction work. The estimates of costs and revenues of this company provide an excellent idea of similar enterprises in the Shanghai and adjoining regions and with allowances for variations in land costs, number of bridges and surfacing, will serve as a general guide for the rest of China. The most important commercial openings are for the sale of motor vehicles, steam road rollers, steel for reinforced concrete bridges, corrugated iron drains of the type employed in large quantities in America and elsewhere for road work, surveying instruments and private telephone installations. From the cross section of the road, it will be noticed that in this alluvial plain where stone is at a premium, surfacing is to be done with ashes, presumably to be collected in Shanghai.



Major-General Li Ying Shih
General Manager of the Shanghai-Minhong-Choling Automobile Transport Co., Ltd.

The proposed road will start from the Wang-chia-Chiuh road on the outskirts of Shanghai and pass through Chin-kung-tang, Chaoho-ching, Lunghwa, Sin Lunghwa, Mei-chia-lung, Chu-chia-hong, Ong-pan-chao, Chan-chao, Pei-chao, Minhong, Tai-pin-shang, Hsiao-tang, Nan-chao, Sintze to Choling on Hangchow Bay, a distance of 95 *li* or approximately 32 miles. The capital of the company is $500,000 (Mexican) divided into 10,000 shares of $50 each. The general manager is Major-General Li Ying-shih, advisor to the civil and military governor of Kiangsu, military commissioner of Shanghai, ex-defense commissioner of Shanghai, commander of the 3rd mixed brigade, etc., and amongst the promotors are such well-known names as Mr. Li Ping-shi, Chang Yiuh-chu, Yao Tze-chang, Mo Tze-ching, Chien Sin-chu, Loh Sung-han, etc.

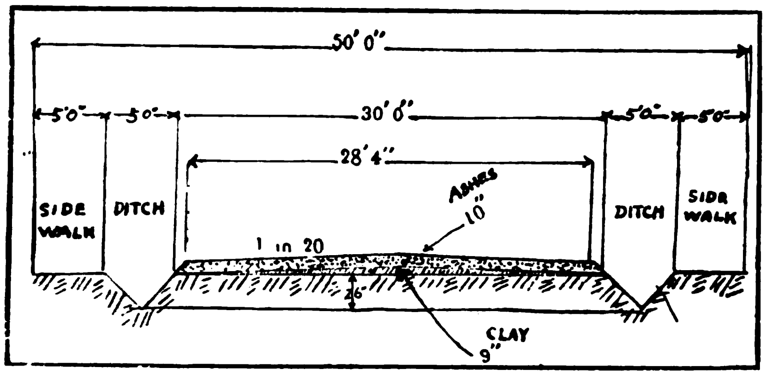
The company will operate 20 passenger cars making ten trips daily between Shanghai and Choling carrying 24 passengers each trip at a fixed fare of 30 cents each from Choling to Tai-ping-shang, the station on the bank of the Whangpoo opposite Minhong. From Minhong to Shanghai the fare will be 30½ cents. This gives a possible total daily revenue of 20 by 24 by 10 by .605 or $2,904. On this basis, the company's prospectus says that a daily profit of



Design of Passenger Bus to be purchased by the Shanghai-Minhong-Choling Co.

$1,560 is possible, which, although not stated, would indicate that the estimated daily expenses is placed at $1,344. The prospectus holds out the expectation of an annual "net profit" of $103,253 after deducting all charges, dividends, etc. The rate of dividend is not given. In addition, the company will operate four freight motor trucks making four trips daily between Shanghai and Choling. The tariff is fixed at $6.00 per trip, or a total of $96.00 per day income from this service. Special cars will also be provided for special trips at higher rates. The passenger cars are estimated to cost the company $7,000 each and the trucks $5,000 each.

These cars, illustrated on the preceding page, are to have a gasoline efficiency of 8 miles to the gallon; 30 h.p.; speed, 20 miles per hour; weight 2 tons; capacity 25 persons; height of car, 6½-ft.; width, 7-ft. 3-in.; length, 18-ft. 3-in.



Sectional View of Shanghai-Minhong-Choling Road

Note.—The drainage ditches are to be placed outside the Side-Walks.

(It was reported in the native press in the latter part of December that this company had recently placed an order with Leewoo, a German firm, for ten passenger and freight cars, the former to cost Tls. 2,700 each and the latter Tls. 2,750 each. The cars are expected to arrive in Shanghai in April next. "Leewoo" is the Chinese hong name of Carlowitz & Company, one of the most prominent German firms in China. It has been impossible to corroborate this report.)

In addition to the cars, the company will construct two steam ferry boats at a cost of $4,000 each for the passage of the Whangpoo at Minhong. There will be 14 stations along the route. The number of employees is placed at 12 mechaniciens, 48 chauffeurs (2 for each car), 44 on the road maintenance gang, 2 launch assistants, 2 launch captains, 2 deck hands and 40 road police.

EXPENSES.—Further light on the costs attached to road building and operating these native transportation companies is given in a separate itemized statement as follows:

COST OF LAND.—917 *mow* (one *mow* equals .15182 acres) of land will be required for the entire length of road, estimated to cost $62 per *mow*, a total of $56,854. The Shanghai station site will cost $2,500. With other expenses and allowances for the removal of tombs, the total cost of land is placed at $76,000.

EARTHWORK.—A total, of about 42,480 *fong*, is estimated as necessary for filling, grading, etc., costing about .33⅓ cents per *fong*, or a total of $14,160.

SURFACING.—The road is to be surfaced with a layer of ashes 10 inches deep over an area of 31,500 *fong* of road. At .70 cents per fong including cost of collecting and wages to coolies, this item will total $22,050.

BRIDGES.—29 reinforced concrete bridges with a total of 480 sq. feet of surface are provided for, the estimated cost for which is placed at $220 per square feet, or a total of $107,900.

AUTOMOBILES.—20 passenger cars at $7,000 each, $140,000, and four trucks at $5,000 each, $20,000, a total of $160,000.

BUILDINGS.—14 stations will be built. The four larger stations at Shanghai, Minhong, Taiping and Choling are to have warehouses and dormitories attached and are estimated to cost $26,000, while ten sub-stations will cost $500 each, a total of $31,000 for buildings.

FERRY BOATS AND JETTIES.—For crossing the Whangpoo, two ferry boats costing $4,000 each and two landing stages at $5,000 each will be required, a total of $18,000.

TREE PLANTING.—Over 24,000 trees will be planted along the road calling for an expenditure of $1,000.

FURNITURE AND FIXTURES.—Telephones, allowances to police stations for additional policemen, surveying instruments, furniture and fixtures for the various stations and offices are estimated at $20,000.

STEAM ROAD ROLLER.—A 9-ton steam road roller at $10,000.

TRAINING SCHOOL—A fund of $1,270 is set aside for a training school for motormen, but prior to its opening, applicants will be sent to the school established by the Shanghai-Taichong Automobile Transportation Company.

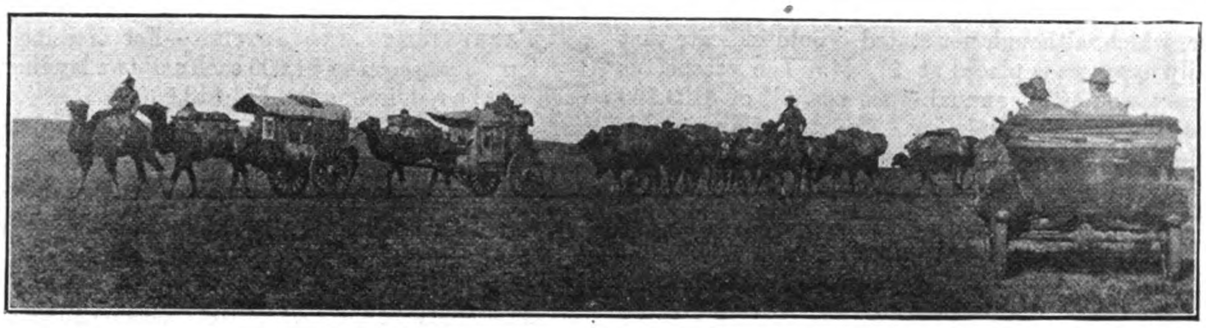
RESERVE FUND.—To provide for deficits in the above itemized estimates, a sum of $36,620 is set aside. Total, $500,000.

If the above estimate be taken as a guide for the volume of new business created for foreign automotive manufacturers, it would be fair to say that the sum of $210,000 roughly represents the initial value of orders for automobiles, accessories, road rollers, drains, reinforced concrete steel, surveying instruments, telephones, building hardware, tools, machine shop equipment, etc., or, about $7,000 ($3,500 gold) per mile. This would not include the follow-up and permanent demand for spare parts, repairs, tire renewals, gasoline, oils, grease and the replacement of worn-out machines in three or four years. It does not represent the possibilities that might be created in other parts of the country where rock is abundant for stone-crushing plants.

Opportunities for Road Making Machinery

It has been commonly accepted that under no conditions can the many labor-saving road-making machines compete with native coolie labor, and therefore the market holds out no inducements for such equipment. In a general way this holds true, but we have witnessed many instances where the reverse is also true. In certain sections of China, perhaps the time will never arrive when labor-saving machines will supplant the coolie, but we are becoming convinced that the old idea about coolie labor is a fallacy, and as China develops and the element of time is more and more taken into consideration, a market will be developed for up-to-date road-making machinery. We believe that the time is opportune for an intelligent study of these conditions on the part of the road machinery manufacturers, by practical tests on the ground. The Chinese, of themselves, will never take the initiative in this matter, and if a market is to be created for modern road-making machinery, the manufacturers should either individually or in combination send out some of their specialties and demonstrate upon the ground what can be done, especially in the saving of time. With large Chinese companies operating with big capital, the element of time will undoubtedly be given due consideration, and once it can be demonstrated that such machines can compete favorably with the native labor, a large and profitable market will be opened. But it will take time, patience and initiative. Like every other success in China, a few years of missionary work will have to be carried on without profits, in order to educate the Chinese. Experience tells us that once these most practical people are satisfied that these machines are applicable and profitable, they can be depended upon to order them in increasing quantities.

The North Manchuria Automobile Co. is being organized by Mr. Chi Hung-quan at Harbin to run a regular service between Harbin and Tsi-Tsi-Har via Suiyuan, and Charhar. Seven cars have been already purchased.



The Old and the New; Camel Carts passed on the Way to Urga

The Opening of Mongolia by Motor Vehicles

THE conquest of the Gobi desert will remain as an epic in the annals of motor transportation. Pluck, energy, resourcefulness, suffering and adventure have been the outstanding features of the many heart-breaking attempts to open up this vast inland waste to modern commerce. Many articles have been written describing the pioneer expeditions into this inhospitable territory, opening up the road from Kalgan to Urga and west from the rail head at Fencheng or Suiyuan to Kwihwacheng and across the desert to Urumchi. The necessity of rapid transportation between Kalgan and Urga, the Mongolian capital, and thence on to Kiachta and the Siberian railway has provided the Russians with many pretexts for devising plans for strategic railways designed for the domination of Peking and striking at Japan in South Manchuria from the rear in Eastern Mongolia. However, these railway schemes fell through, and the conquest of Mongolia devolved upon the automobile. In 1913, the Mongolian Trading Company, a subsidiary of an American firm (Andersen, Meyer & Company), pioneered the way with a monthly service of Ford cars between Kalgan and Urga. Although the activities of the various companies in opening Mongolia to motor traffic have been very fully described in previous numbers of THE FAR EASTERN REVIEW, we extract from a recent article written by Mr. Verne Dyson for the *China Press* the most up-to-date facts on this subject. Mr. Dyson, in describing the operations of the northwestern motor service, says that about five years ago Major-General Tinge Si-yuen, then managing director of the Peking-Suiyuan Railroad, suggested to the ministry of communications that the government should consider the building of a railroad between Kalgan and Urga, a distance of 672 miles, as a military precaution in the event of a revolt in Outer Mongolia, but the government could not finance it and the plan was given up. Then the general suggested a motor service between Kalgan and Urga. Enough money was available to buy five or six motor cars and so the line was established under the guise of a strictly business enterprise when, in fact, it was a military measure.

At this time the automobile was not entirely unknown to the Gobi desert region for in 1913 the Mongolian Trading Company, an American concern, began operating a monthly service to Urga, using Ford cars. This line was still in operation at a late date but with its energies confined strictly to company business.

Then in 1915 the Chinese Merchants Motor Car Service began transportation across Mongolia. For a while two or three Ford cars were dispatched from either end of the route every ten days. Heavy trucks were tried on this line but without success. After three years the company suspended, due to a breakdown in management and scarcity of money.

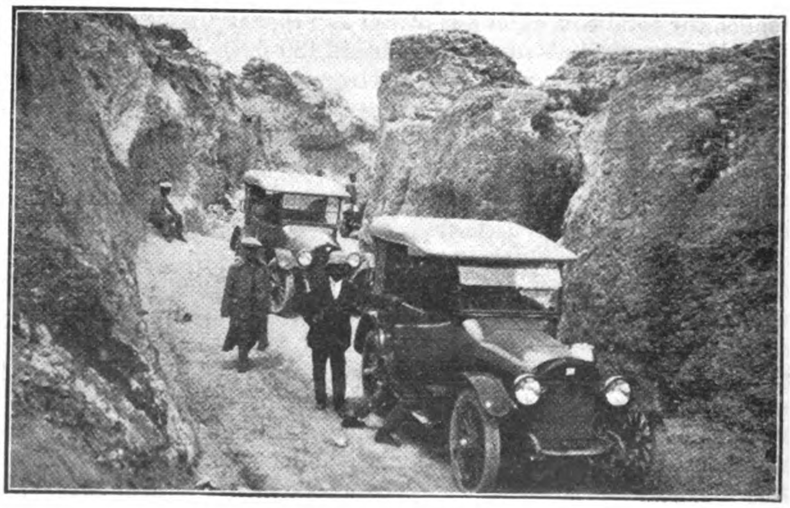
The government's project, the north-western motor service, came into being in the summer of 1917. Mr. Y. C. Loo, the superintendent, started on his path-finding trip on June 16 with a fleet of five Buick touring cars (six cylinder). The operating force consisted of two mechanics and seven drivers. There were several government officials, including Mr. Yu Yen-feng, now managing director of the Peking-Hankow Railroad and then an engineering expert with the ministry of communications. Mr. Yu had his secretary and there was another engineer, Mr. Huang.

On this initial tour the principal cargo of each car was gasoline. Aside from its regular tank, each machine had a forty-gallon tank on each of its two running boards. One car carried twenty-three 10-gallon cases of gasoline.

The first lap of the journey was Kalgan to Pang Kiang, 147 miles.

The expedition remained in Pang Kiang three days, repairing, testing and tuning-up. Made Udda, the next stop—119 miles—by 8 p.m. on the first day without mishap.

Lama Temple near Top of Plateau, about 40 Kilometres from Kalgan



Near the Top of the Plateau

Between Udda and Turin part of the road was missing. There was no serious trouble, however, and the distance of 114 miles was covered before dinner time. It is a short run between Turin and Urga, only 89 miles, and the destination was reached at 4 o'clock in the afternoon. There was a stay of one week in Urga before the return trip began.

Thus was the north-western motor service inaugurated. On August 5 three cars started from Kalgan with seven passengers. The cost of a one-way ticket was $120, and each passenger was allowed a maximum of twenty catties (thirty pounds) of baggage.

The three cars brought back twelve passengers and business continued to be good. When the traffic was suspended on October 10 on account of the cold weather the line had made a net profit of $4,000. The government was pleased and Mr. Loo was sent to Shanghai to buy more cars and a vulcanizing plant.

Five more Buicks were placed in service when the line resumed operation in March, 1918. By that time Mr. Loo had established a repair shop and a vulcanizing plant. The garage, the first in Kalgan and the most northern institution of that kind in China, was established in a remodeled railway godown. There was room to store thirty-five machines.

From Shanghai Mr. Loo transported considerable machinery for the repair plant. The equipment included a lathe, drill, planer, shaper; a Delco light plant for lights and for battery service; and a compressed machine. Being a motor car-engineer, Mr. Loo took pride in making it a model garage. He had seven mechanics.

On the first trip of the 1918 season there were twenty-two passengers and business continued to be good up to October when traffic was suspended. A total of eighty tires and twice that many inner tubes were worn out that season. The net profits for the months were $25,000. Again, the government was pleased and Mr. Loo was directed to buy more Buicks and he added eight to the string. It was decided to operate the line all through the winter of 1918-19.

"We managed to keep the cars going all winter although it was from thirty to fifty degrees below zero for about four months," Mr. Loo explained. "Under these conditions motoring reaches the maximum of hardships. In the radiators we used a mixture of half alchohol and half water. In cold as intense as this the engines had to be kept going continuously, even at night when we were not running. We had to have a guard who stayed awake all night and kept the engines running slowly. You can imagine the difficulties of starting an engine when it has cooled to 50 degrees below zero."

During the winter three to five cars left Kalgan for the north every ten days. The total income for the year, ending with October, 1919, was $140,000 and of this amount, $80,000 was clear profit. Once more the government at Peking was pleased and again Mr. Loo was directed to buy more cars. In the fall of 1919 he purchased twelve 7-passenger Buicks. There was now a total of twenty-four cars in operation.

Immense profits were expected from the line in 1920, but early in that year began the revolt in Outer Mongolia. By April all commercial passenger service had been suspended and the entire equipment of the line was devoted to transporting the soldiers of General Hsu Shih-cheng ("Little Hsu"), the commander of frontier defense.

All through that summer the motor line was devoted to military uses. When Baron Ungern took Urga he confiscated three motor cars belonging to the government's motor line.

While the Peking government was frantically engaged in transporting troops across Mongolia, eighteen one and two-ton trucks were purchased to augment the touring cars. The trucks were found to be too heavy for the roads and their use was discontinued after only four trips.

All through 1921 the equipment of the motor line, costing a total of about $250,000, has remained idle at Kalgan with the exception of passenger service which has been maintained between that place and Dorlonor, the distance of 300 *li*, and without profit.

For more than one year the hostility of the Mongolian officials in Urga and the numerous bandits along the northern part of the route have made it impossible to operate the line, but these conditions have changed now, it is said, for the better.

The Packard Record

Although the Ford and Buick machines played such a prominent rôle in the opening of communications with Urga, their exploits were eclipsed later on by the daring trip of Lieutenant George Moskovski of the Polish army in shoving through over 2,000 miles of desert between Fenchen and Urumchi the capital of Chinese Turkestan, with two Packard twin sixes hauling trailers, and returning over the same distance to their starting point. The caravan that started on this epoch-making trip consisted of two Packard cars, one Pierce-Arrow 2-ton truck, with a four-wheel trailer, a Broadway truck with a two-wheel trailer, an Empire sedan, an Empire touring car and a Ford. This expedition started out to prove that motor transportation was possible and that goods could be brought from the interior to the market in a much more efficient manner than could be obtained through the use of camels and other beasts of burden.

The roads ended at Kweihwacheng, and three cars and the two trucks were forced to put back. The two Packard twin sixes, however, continued. Both carried trailers. They were followed at several days interval by camel trains which carried supplies for the return trip as gasoline stations are not exceptionally numerous in Western Mongolia. Long stretches of deep sand added to the difficulties of motoring, and in one instance, the sand was so deep that one of the trailers had to be abandoned. At a point about 700 miles west of Kukuirigou, and 300 miles north of Kanchow the motorists found themselves confronted by a long range of mountains and sand hills through which the guide was unable to discover a pass. As this region was the very heart of the desert and practically uninhabited, there was no one to turn to for further information, and the few natives seen fled precipitately from the "devil wagon." Eventually, a pass was discovered and the party proceeded.

In spite of the handicap of the trailers the two cars finally reached Urumchi about two months after leaving Tientsin.

The actual traveling time was, of course, but a small fraction of this period. The same hazardous features were encountered upon the return trip.

The trip proved that while it is entirely possible to substitute the motor car for the "ship of the desert," the old methods will likely continue for some time, as only a car of the very highest quality and with a super-abundance of reserve power can stand up under the trying conditions of the trip.

The Packard Stuck in the Sand 300 miles from Kukuirigou

Canton's New Maloos

NO other city in China proper can show the results of clean government in good roads and streets as the capital of the southern republic, where, under the stimulus of Dr. Sun Yat-sen and his son, Mr. Sun-fu, the mayor of Canton, a group of young western-educated engineers are making a record for themselves that will stand as an example of what can be done in China under an honest administration. Although much of the credit belongs to those higher up, the actual work of reform is being carried out by a group of earnest young men whose names do not always appear on the plans and other official documents given out for publication. The work of improvement goes back to the early days of the revolution, when General Chen Chiung-ming, acting governor-general of the province, approved the scheme of Mr. Cheng Tien-tow, a graduate of an American school, then head of the public works department, to tear down the old walls to provide space for new roads. Some progress was made in this direction, when the reactionary Gen. Lung Chi-kwong assumed control of the government, and ordered the walls to be rebuilt with the old materials. When this northern satrap fled and the new element returned to power, a municipal council was formed to take measures to build streets and lay out parks, and Mr. Lun Wan-sheung, an English B.Sc., engaged to act as chief of the public works department. However, another change brought Mr. H. L. Wu into the direction of this office and under his supervision most of the actual work has been carried out. Mr. Cheng Tien-tow and his associates, Mr. R. C. Johnson, now chief engineer of the Canton-Samshui Railway, and Mr. H. L. Wu mapped out the work. The present director of public works, Mr. H. L. Wu, received his technical education at the Ohio Northern University and University of Illinois, U.S.A., and on his return in 1911 joined the Canton public works, then under T. T. Cheng, as engineer, resigning in 1915 to join the American section of Szechuan-Hankow Railway.

A Fire in Canton's Narrow Streets. Fires are frequent in Canton and give the Government a chance to rebuild the burned districts along modern lines

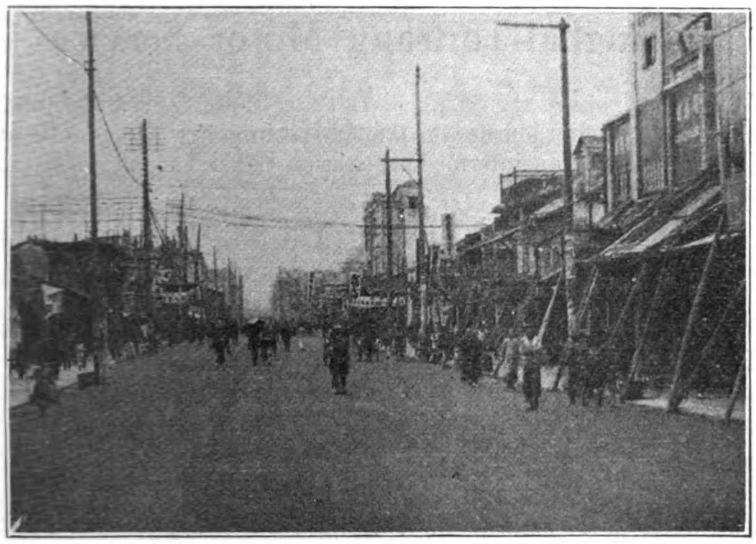
Canton's Famous Streets, now giving Place to the less Picturesque Paved City Street

Mr. Wu is a charter member of the Chinese Institute of Engineers and a consulting engineer of the Koushing Engineering Co., a concern composed of the well-known Chinese mining engineer Mr. C. S. Lowe, and Mr. Peter Soohoo, an associate member of American Society of Civil Engineers; Mr. G. Y. Fong, an electrical engineer, and some other experienced engineers in that city. In 1912, after the big fire in Canton, Mr. Wu introduced many modern streets among which are an important portion of the Wing On avenue, the West Bund and the Cooper Island, Tai Sha Tau. He directed the survey party and planned out the reclamation work of the island in 1913.

Co-operating with Mr. Hu are other bright, forward-looking, hustling young Chinese in charge of other municipal departments. Directing the public park bureau is Mr. Yeung Sik-chung, a B.A. graduate of the College of Architecture, Cornell University. If his plans carry through Canton will have five public parks. The chief of the land department of the Canton municipality, Mr.

TEARING DOWN THE OLD WALLS OF CANTON

Six miles of wall containing 800,000 cubic yards of masonry and dirt were demolished to make room for broad new highways along which rush the modern motor car and autobus



A Broad New Maloo in Canton

On the Way to the City Yamen

Luan Chang, is a graduate of the Tangshan Engineering College, an M.S. from the University of Illinois, gaining his practical experience as designer with the Baldwin Locomotive Works and as ordnance designer with the Bethlehem Steel Corporation. Before joining the municipal government he acted as technical adviser to the Kwangtung Arsenal. At the head of the fire department is found Mr. Chue Yue-tat a bright and active young engineer who is bringing his department into line as rapidly as finances will permit. In Mr. Chen Chung-ming, the city of Canton has acquired another live wire as chief surveyor. These young men, working in close co-operation with Mayor Sun-fo, are rapidly transforming Canton from the "City of the Awful Stink" into a place fit for human beings to live in.

The demolition of the walls gave employment to over 6,000 laborers working under nine contractors who were awarded the contract in sections. The total length of the old city wall was nearly six miles with an average height of 24-ft., a width of 43-ft. at the bottom and 35 at the top. The wall around the new city was 15-ft. high, 17-ft. wide at the bottom and 13-ft. at the top. The work of demolition involved the removal of some 800,000 cubic yards of masonry and dirt, and was commenced in December 1918. With this as a start, the work of road building has gone on apace, and under the rule of the Kwangsi military government in 1919, the old wall disappeared and 37,000-ft. of broad highway was constructed. This good start was continued under the new administration which has to its credit a further 30,000-ft. of avenues with another 50,000-ft. under construction. The plans call for the extension of the bund around the Shameen island and the gradual extension of the wide street system over the entire city and into the surrounding country. In extending the city limits great difficulties have been experienced in the removal of millions of graves. Only in this manner could proper provision be made for the living, and much new and valuable building land has been made available. In connection with the street system goes the creation of parks, playgrounds for the children and tree planting. One public garden has been completed and three more are awaiting necessary funds for development. The plans also call for the sale of all the old official yamên sites and with the funds so obtained a new civic centre will be erected in which all of the municipal and provincial government offices will be housed. The American influence is again seen in this new departure, as the work has been entrusted to the well-known firm of American architects, Murphy & Dana, the designers of the Rockefeller Foundation at Peking, the Yale in China at Changsha, and other important buildings.

With the construction of wide streets the automobile, auto bus and truck have made their appearance in large numbers. Within a few months after the opening of the new roads over forty motor cars and a motor bus service were in operation in a city which for centuries had been practically closed to wheeled traffic. Each month sees some new advance in road building and the extension of motor car and bus services.

By July of last year, or within a little more than twelve months after the opening of roads in the city, 125 motor cars were registered with the Canton municipal government, and many road and auto bus schemes are now on the tapis and gradually assuming tangible shape. One of the motor bus lines in Canton is operating 15 F.W.D. trucks manufactured by the Four Wheel Drive Auto Company of Clintonville, Wis. These trucks are equipped with passenger bodies made in China, each truck hauling a trailer, the combined seating capacity being 70 persons. A motor road has been proposed to connect the city with the famous Loh Fo Hills which will cost $150,000 to construct. With the proceeds from the sale of public

The Motor Bus lines now Competes with Canton's Rickshaw and Chair Coolies. There are several of these lines running a regular service along Canton's New Maloos. The Fare is Ten Cents, Silver

properties and a sum of $100,000 from the provincial treasury the public works department called for tenders in July for the construction of the uncompleted sections in the first road system including the Pan Fook Maloo, the great South Maloo, the Yet Sou Central and the Mun Ming Maloo.

By December witnessed the completion of the extension of the Yuek Shau Mâloo, 6,000-ft. in length, connecting the Ta Sha Tau station of the Canton-Kowloon Railway and the northern section of the same highway.

The survey of a road from Canton to Tsing-Sing district is now finished. The road will start from Sha-hoo, outside the east gate, *via* Inn-tong and through the foot-path of the white cloud mountain directly to the district of Tsingsing, a distance of sixty miles.

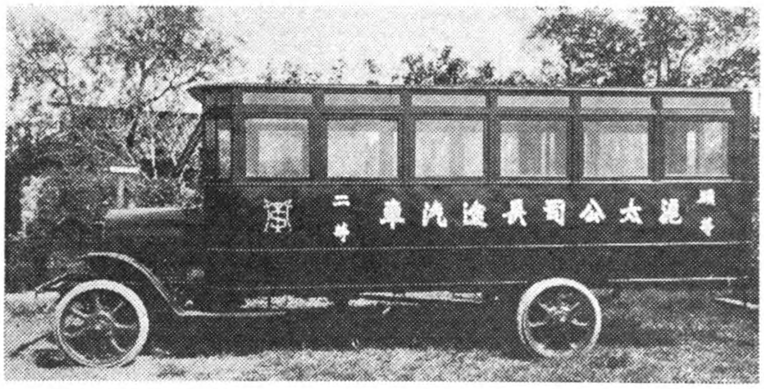
The public works department has issued an announcement that several maloos will be opened in Saikwan in order to facilitate communications in that part of the city. Starting from the western end of Sap Sam Hong Street, a 40-ft. maloo will be built to the eastern end of the street with a 10-ft. sidewalk on each side of the maloo. Another maloo of the same width will connect the west bund and the present Sap Sam Hong Street. The Wing Yang Street and the Tak Cheng Street will be widened to 20 and 24-ft. respectively. The above schedule has been approved by the executive council of the municipality and surveying is going ahead.

That Canton is awake, spurred onwards by the zeal of young China to show the world that they can do things, is attested to in many other directions. Communications and public works are receiving all the attention and revenue that is not diverted to the military campaign against the north. At the request and under the authority of the provincial assembly, the city engineer is now working out the plans for a steel bridge over the Pearl River to connect the city with Honam that will cost $2,500,000.

The New Bund, Canton, A Magnificent Avenue

Shanghai-Taitsang Motor Service

THE first 'bus of the Shanghai-Taitsang Motor Service Co., Ltd., made its first journey on January 1st from new Kung-ho Road, Chapei, to an intermediate station called Tazang, 18 *li* (six miles) from Shanghai.



Type of Autobus on Shanghai-Taitsang Service

For the first week the trips will be, more or less, trials for the new service which will later extend to a suburb of Taitsang called Liuwu, a distance of about 72 *li* (24 miles) from Shanghai. Work on the road between Shanghai and Liuhu has been finished but there are still several bridges in course of construction which need to be completed before the through service starts. This road is being built by the Paoshan district authorities and rented to the Shanghai Taitsang Service Co. is about 30-ft. wide. It is estimated that the cost will not be less than $300,000, which sum has been paid by the company as a franchise fee. There are about 40 bridges altogether and nine stations, namely, Shanghai (Chapei), Panpoo, Tazang, Tongchao, Liuhong, Lootien, Pankiachao, Zauchinchao and Liuwu.

The motor-buses to be used are of American make, especially suited for the local conditions. At present there are four large carriages and four small ones. They cost approximately $4,000 each. When business improves later on, the company expects to be able to attach trailers. The larger carriages seat 30 passengers and the smaller ones 15. The present cars are divided, like the ordinary tramcar, into two compartments, the first and second classes.

Fares are as follows:—

Shanghai to Panpoo—
- First class 15 cents.
- Second class 10 cents.

Shanghai to Tazang—
- First class 30 cents.
- Second class 20 cents.

Pampoo to Tazang—
- First class 15 cents.
- Second class 10 cents.

And *vice versa.*

It is expected that the through service to Taitsang will be started about three months hence.

The Shanghai-Taitsang Motor Service Co., Ltd., was formed last year by Mr. Hung Pah-yuen, an ex-Shanghai district magistrate who is the present chairman of the board of directors, Mr. Tsu Hai-shu, general manager of the company, and a number of other Chinese. It is purely a commercial company and has an authorized capital of $500,000, $300,000 of which has already been paid up.

Road Construction in China

SUCH data as is available for estimating the cost of road building in China is largely the result of the careful tabulation of expenditures kept by the American red cross society's engineers in constructing the highways in Shantung, Chihli and Shensi. We assume that the full reports of this work can be seen at the Red Cross headquarters in the United States, where the manufacturer of road-making machinery and contractors desiring information about item costs will receive every courtesy. However, some interesting information was given out in a recent lecture delivered by Mr. Lawrence Impey before the students of Peking College. Mr. Impey was chief engineer of the Red Cross during the recent famine relief operations in China and in that capacity did splendid service. We are indebted to the *Peking Daily News* for the full report of this lecture. After sketching rapidly the preliminaries leading up to the actual commencement of road construction, Mr. Impey then concentrated on the engineering problems, pointing out that the work originally commenced in Shantung was begun in the winter months when work is not usually done, and therefore the difficulties there were much greater than in other sections.

Again, the large quantities of sand encountered made construction very difficult, as there was no rock available, unless a light railway should be laid, and rock quarried and brought in from Tsinan, while there was almost no clay to be found either to serve as a binder to the sand. Up in Shansi the construction was of a very different character, as the road passed through mountainous country, and a large amount of rock cutting and blasting was necessary, together with the construction of numerous culverts and bridges to allow of the free passage of the streams which rise so rapidly in the rainy season, as to render traffic extremely difficult, if not dangerous.

In principle it was arranged to construct a twenty-foot highway, with a crown six inches above the side of the road, and a slope to the bank of less than forty-five degrees, while the whole road was raised several feet above the surrounding country where possible, in order to avoid the danger of floods. A two-foot "berme" or footpath was constructed half-way down the bank on both sides, partly to avoid subsidence, partly to give greater safety to traffic, and in many cases trees were planted along this to establish it and to shade the road.

A fifty-foot right of way was found to be necessary to provide the material for the road construction, and the excavations on each side of the road served as drainage ditches. The earth was thrown into place by hand, Chinese and foreign shovels being used together with carrying baskets, and the soil was then rolled or tamped in six inch layers by wooden hand tamps or stone rollers such as the peasant uses in his grain yard.

It was found that this construction would carry a loaded Ford truck quite satisfactorily at a speed of some thirty miles per hour, and that the laborers could place and tamp about one *fong*, or one hundered cubic feet, English, of earth per day. The workmen were recruited from the afflicted villages after an examination by the Chinese and foreign committee, and were organized in gangs of thirty, each under a headman of their own choosing, and each gang bringing their own cook.

Camps were provided in the villages along the line of the proposed road by arrangement with the village headmen and the *hsien* magistrates, not more than three hundred men being in any one camp, in order to avoid disease and facilitate handling and feeding. Several gangs were grouped together under a Chinese foreman, and were allocated to a certain section of road, while every ten *li* or so was under the supervision of a foreigner. Chinese inns and old temples were used as camp headquarters for the foreign staff and the clerks, interpreters, head foreman of the section, etc., and here under the district storekeeper was held the grain for feeding the workmen.

The payment consisted of five catties of mixed grains for each *fong* of tamped earth, and to enable this to be made a record was kept of the daily amount of work done by each gang, which was balanced every two weeks. A daily ration of about two catties of grain per man was made, together withan issue of fuel and salt and vegetables, which every night the gang accounts were settled up, and the men allowed two days to take their surplus rations to their families. I think that it is advisable not to move workmen more than sixty *li* from their homes where it can be avoided, and to only recruit sufficient to carry out the work in that area in a given time, about three or four gangs to a *li* being sufficient as a rule.

To turn now to the figures of the last famine relief, the total funds expended were Mex. $2,428,000, subdivided as follows:

	Amount	Per cent.
Food and wages to workmen	$2,025,000	83
Medical and sanitary	25,000	1
Commissary, stores, salaries	92,500	4
Engineering and transportation . ..	181,000	8
General (Peking and field headquarter).	104,000	4
	$2,428,000	100

The cost of the various roads per mile is approximately as follows:

Shantung dirt road	per mile	$1,719
Hantan dirt road	,,	3,500
Shansi dirt road	,,	6,410
Honan rock road 85% macadam ..	,,	1,200
Tientsin dirt road	,,	
Peking dome macadam	,,	4,166
Tientsin dirt road	,,	
Paotingfu over old cart track	,,	600

Altogether 860 miles of road were built at an average cost of $2,823 per mile, employing over 50,000 workmen altogether, and feeding some 250,000 dependants, the whole of the operations, from the inception to the closing down of work, taking nine months. Comparing this with other figures, the most economical I can find are those of the Taokow-Chinghua Railway, which shows a cost of $1,383 per mile for earthwork alone, to which would have to be added such items as bridges, overhead, etc., while it should be recognized that that work took place some fifteen years ago, when the cost of labor and food for labor was less than half what it is at the present time.

With regard to road construction I would like to point out that the narrow tired cart is the most destructive instrument of transport I have seen, and it should be either kept to a track at the side of the main road or done away with by means of a subsidy if possible, and a broad tire substituted. The greater part of the time and labor employed is used on the cuttings, embankments, etc., and only a small amount of skilled labor on the bridges, culverts and permanent way, so that I think in the future it will be found quite practicable to employ famine work on this very important branch of communications.

There are two principal difficulties which present themselves to the worker on these lines which I would like to refer to in closing. Firstly, the decentralization of government has rendered it difficult to inaugurate and carry out any united policy, while the people in general seem apathetic to the action of the authorities, unless it affects them directly. Secondly, the idea of public service seems to be in abeyance, possibly owing to the continued dominance of military and official rule, and until that is aroused very little can be accomplished.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, JANUARY, 1922.

The Future of Transportation in China

(A Word to the Consortium)

THE prolonged consortium deadlock and consequent delay in railway construction in China has undoubtedly created the opening for the extension of motor highways and the sale of cars and trucks, opening markets for one group of maufacturers, while others, dependent to a greater degree upon foreign financing, are compelled to sit tight until some way is found to overcome the obstacles to re-opening negotiations for railway loans. There is every evidence that the higher Chinese authorities are awakening to the fact that new highways and motor transportation under their own control are a greater and more immediate source of profit and revenue than foreign loan-built railways with their supervision over expenditures and operation. A highway scheme that promises anywhere from twenty to fifty per cent. profit the first year, holds out a much greater inducement than a mere eight per cent. railway loan from which adequate returns may not be forthcoming for many years. The prospects of high profits held out by these new companies comes nearer the Chinese idea of business and the old pawn-broking system of banking, than anything yet placed before them.

It is significant of the trend of the times, that one of the first acts of the new Liang Shih-yi administration was to issue a mandate exhorting the people of all the provinces to unite with the officials in opening up new roads, emphasizing their urgent necessity to promote commerce, industry and prosperity. The new Peking cabinet has been selected from the most coldly practical clique that modern China has produced, business men, promotors, financiers all, who think in terms of millions, and have had a finger in nearly every scheme of importance negotiated these past twenty years. A shrewder group of financial politicians cannot be found in any other country of the world. They have Tammany backed off the boards ; Mark Hanna and other politicians of a past generation who carried the American senate in their vest pockets, could sit at their feet and imbibe wisdom in the ways of running a government for the benefit of Big Business.

The new cabinet, is, in effect, a railway, or perhaps better expressed, a transportation group, whose power and wealth is derived from successful manipulation of the existing state railway revenues over a period of ten years or more. These keen practical minds with an inside knowledge of construction costs, volume of traffic and surveys of all parts of the country at their command, realize the possibilities of motor transportation, and apparently, have lost no time in encouraging the movement for the cheaper, and for them, the more profitable system.

It must be remembered that one of the most difficult problems facing the present Peking government in connection with formulating a national railway scheme that can be negotiated with the consortium, is the tendency of the provinces to revive the demand for autonomy in the construction of railways, a tendency strengthened by General Wu Pei-fu's policy of federalization. A federal government for China would deprive the central authorities of a monopoly over future railway financing, and make difficult the functioning of the present consortium or any other grouping of foreign capitalists. The new cabinet undoubtedly had this situation in mind in issuing the mandate encouraging the building of new roads as an outlet for provincial capital and so satisfy the craving for a share in transportation profits. Once the people and the provincial officials co-operate whole-heartedly in the construction of highways and operation of motor lines, there will be less and less clamor for recognition of their rights in financing the railways. With provincial capitalists confining their energies to road construction and motor transportation, the less profitable railways could with perfect safety be left to the foreigner to construct by means of loans. If Peking could bring about such an understanding it would materially clarify the atmosphere and perhaps facilitate the resumption of negotiations with the consortium.

In order to meet the new conception of government in the early days of the republic, Dr. Sun Yat-sen drew up a plan for financing China's railways based on the recognition of provincial autonomy, in which, because of the inadequacy of the central government's revenues to meet the interest, the loans would be secured by provincial bonds guaranteed as to interest and principal by Peking. Certain provinces are again raising the cry of "provincial rights" with General Wu Pei-fu, supported by many influential foreigners, advocating a federal state, which means in its last analysis, provincial autonomy and jurisdiction over the railways within their borders. With these unsettled questions delaying the unification of the country, by bringing the people into closer communication by means of railways, it is almost hopless to talk about national railway schemes or policies.

In our opinion, the difficulties attached to financing China's railways by means of loans secured by provincial bonds guaranteed by Peking, are insurmountable. It would seem, however, that the provinces might well be satisfied (at least during China's period of reconstruction) with a monopoly of highway building and motor transportation, which could be carried out by local capital, and leave the more expensive railways to be built through the issuance of foreign loans by the Peking or other recognized government.

If, as has been commonly accepted as the truth, the provinces have been actuated in their demands for recognition of provincial railway rights by a desire to participate in the financial benefits alleged to have been monopolized by Peking, a division of activities, whereby they would control the highway and motor transportation within their borders, should amply satisfy their craving and bring to them the most profitable end of the spoils. For, it is now being conclusively proven in all highly developed countries with proper highway systems, that motor transportation is fast crowding the railways, especially in the matter of short hauls, and diminishing their former earnings to a point where the future has become a matter of grave concern to their shareholders.

Motor transportation has not only passed the stage of being an auxiliary or feeder to the steam railways but has entered the stage of active and destructive competition. In the Far East, we have only to look at the situation in the Philippines, where, on the island of Luzon, motor transportation has so seriously undermined the earning capacity of the Manila Railway Company, that protective legislation has been demanded by the railway. This condition is due to the loss of their short haul traffic, taken over and monopolized by the numerous motor bus lines. And this condition will prevail in any Oriental country, where the question of time is of no particular consequence to the native. In other countries, the effect of good highways and up-to-date trucking methods has driven the short haul traffic entirely to the motor transport companies. The huge volume of cotton which formerly was carried by rail between Liverpool and the Manchester mill towns is now entirely transported by truck and the finished product is also handled in the same manner. In the United States, the silk motor truck caravans have taken over the transportation of this valuable commodity between the docks in Jersey city and the mill districts of Patterson.

In England, much of the coal is now transported on trucks. Roads in England and on the continent are good, the distances are short and heavy grades are few. The conditions arre ideal, and with the general use of trailers the costs are below those of the railways. As many as four trailers are now hauled by steam

trucks. The railways, while employing trucks for their own deliveries and collections, are being hard hit by a competition that has lost to them the short haul traffic. Another phase of European motor traffic consists in the heavy rails and road bed made necessary by the fast passenger trains, which has greatly increased construction and maintenance costs. These expensive road beds are not essential for the slower moving freight traffic, so the road bed, although the biggest investment, is the least used part of the railway, abnormally increasing freight rates.

All over Europe the motor truck is now not only an essential adjunct to the railway, but it has found a distinct place for itself, to the extent that new conclusions are being formed as to the place of the railway in the national economic system. It may turn out, if developments continue at the same pace as they have since the war, that the railway may ultimately be serviceable only as a special and not a general carrier, and so revolutionize the present ideas of transportation. This conclusion is also being forced home by the rapid development in Europe of air travel and transportation, displacing the railway for fast mail and passenger service.

What is taking place in Europe, to a certain extent in America, and under our noses in the Philippines, will follow in China as new roads are built. Local and short haul traffic between towns and cities will gravitate to the motor truck and omnibus, and the railways will get only the slow-moving, long-haul freight, and through passenger traffic. The cotton and the crops of Kiangsu will be hauled to market and the mill centres by motor trucks and the railway to Nanking and Hangchow will depend more and more upon through goods and passenger traffic. And so, in all other parts of China, the motor truck will open up and develop regions which the railway can never hope to penetrate.

With these conditions before us, militating as they do against any large profits from prospective railways, a situation is created that must be taken into consideration in any estimate of earnings of projected railways, a consideration that may well have an important bearing on loan terms and conditions. It seems fair to prophecy from present indications, that before any extensive railway scheme for China can be financed and the lines constructed, motor roads and transportation will have connected up many of the most important districts embraced within present railway projects. As these profitable highways and motor transportation services will be financed largely from private and provincial sources, it would seem that they might be content with this and concede a free hand to the central authorities to make such foreign loan terms for railway construction as new conditions may compel them to accept.

We can think of no combination that would be productive of more good to China than this, and if conditions so warranted, the establishment of a special sino-foreign bank operating outside the consortium agreement to finance these roads on approved provincial securities issued through and with the added guarantee of sound Chinese banking institutions, the work of the consortium in the development of new railways would be greatly facilitated. If foreigners are to live up to their oft expressed faith i n the honor and integrity of the Chinese business man, as opposed to that of the official class, here it seems, is a good place to put into practice what they so loudly preach.

Heretofore, foreign financial assistance in the construction of China's railways has been extended for the purpose of creating markets for railway materials. The world has moved ahead, and the great automotive industries now clamor for similar assistance. In the case of the United States, the automobile industries last year paid in federal taxes alone, the sum of nearly $150,000,000. In return, the American manufacturer of motor vehicles is asking for the assistance of his government in developing foreign markets. The government has responded by creating an automotive division in the bureau of foreign and domestic commerce, and is sending a special expert to Asia to investigate conditions. Such an investigation will bring little practical benefits to the rapidly expanding automotive industries, unless countries like China can be made to purchase more and more of their products. Increased purchases can come only from the construction of new highways, and these must be financed. If the Chinese are unable to finance them alone, some practical plan should be evolved so that American investors can assist in this much needed development. There is no practical way to facilitate this except by relying on the good faith and accepting the securities of prominent Chinese or the sino-foreign banks who could take over provincial or municipal bonds, guaranteed, if necessary, in part, or in whole, by the central government. Such agreements could and would carry with them the provision that the automobiles or trucks employed by the road and transportation companies should be purchased from the country supplying the loan. As with America, so with other countries who manufacture motor vehicles for export.

In the past, too much stress has undoubtedly been laid on the future market for railway supplies in China and too little on the possibilities for the sale of motor vehicles and accessories. If the consortium cannot extend financial assistance to the development of a market for the important automotive industries of their various countries, then some other instrument should be created to take over this important task. G. B. R.

Shanghai-Nanking Profit Certificates

WHEN the £2,900,000 of Shanghai-Nanking 5 per cent. sterling bonds were issued in 1903 to build the railway of that name, subscribers for every £100 bond received one profit certificate which entitled the holder to claim a payment out of the net profits of the railway, the amount allocated to the certificate holders being one-fifth of the total net profits of the line. Naturally it took some time to build the line, and then it did not produce for years sufficient revenue to meet the full service on the bonds. The difference had to be provided by the Chinese government, and when the railway turned the corner and earned profits there were long-drawn-out negotiations to clear up the position as to how the deficiency arising from the working of the early years could be treated. It was finally decided that the deficiency had to be paid back before the profit certificates received a distribution, and in consequence of this it was not until the present year that a distribution could be made upon these profit certificates, the actual distribution being £1 per certificate, which required £29,000, as the number of certificates in existence is 29,000. The market for some time has taken an interest in the certificates, and occasionally there have been some quite numerous transactions, but there is a good deal of mystery as to the figures reported by the line from which the distribution was made. The distribution, we might state, was for the year 1920, and in that year we understand that the surplus profits amounted to $2,259,000, which had a sterling value of something like £326,000. One-fifth of this would amount to over £65,000, but the balance of the deficiency on the working of the line had still to be paid off, and other charges came upon the surplus profits, with the result that the amount divisible on the certificates was reduced to $1,120,000, which gave a sum of just over £29,000, and allowed of the distribution already mentioned. The position now is that the line has a clean slate in regard to the division of its surplus profits, and if net earnings are maintained it is evident that for 1921 the distribution upon the profit certificates should be much more than the one just made. Something over £2 seems quite feasible, and as the certificates stand in the market at about 12 ex div. they offer a rather tempting investment. The Chinese government have the right to purchase the certificates at £20 apiece, and as they had a life of fifty years they can run until 1953 if the purchase is not exercised. If the earnings of the line are going to remain at anything like the level of 1920 it would be a profitable operation for the Chinese government to purchase the certificates, but the holder would be indifferent to this matter, because the revenue is such that it would be preferable to allow them to run for over thirty years than to have them purchased at £20 apiece.—*Stock Exchange Gazette*, October 27th, 1921.

A NEW AVENUE OF SERVICE

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Tangles of the Times

The Mistake that John Hay Made

WHEN Secretary John Hay in 1898-99 invited the powers to subscribe to the "open door" doctrine and the inviolability of the territory and sovereignty of China, certain very important and vital facts bearing on her status were concealed from him. The existence of the Li-Lobanoff secret treaty of alliance between China and Russia directed against Japan, and certain other important documents defining Russia's privileges and position in Manchuria were known only to an exclusive few in Peking and St. Petersburg. As long as American statesmen and editors refuse to view subsequent events in the light of the confessions of Count Witte, so long will they be unable to understand Japan's position. *The New York Herald* of November 9, in an editorial headed "The Distinction John Hay Made," disclosed a letter written in 1904 by the secretary of state to the editor of *The Sun* in which Hay explained the meaning of his note of instructions dated February 10th, 1904, to the American diplomatic representatives in St. Petersburg and Tokyo concerning the neutrality of China. This note read as follows :

"You will express to the minister of foreign affairs the earnest desire of the government of the United States that in the course of the military operations which have begun between Russia and Japan the neutrality of China and in all practicable ways her administrative entity shall be respected by both parties, and that the area of hostilities shall be localized and limited as much as possible, so that undue excitement and disturbance of the Chinese people may be prevented and the least possible loss to the commerce and peaceful intercourse of the world may be occasioned."

The *Herald* adds :

"The purpose and scope and limitations of this effort on the part of the sane statesman who gave to the country and the world the American doctrine of the "open door" were explained three days later in a private note for the information of the editor of *The Sun*. This letter, we believe, is now for the first time printed :

"I think you will see there is no dynamite in this and no 'promise or potency' of it.

"*We are not forming an alliance with any one* ; we are not binding ourselves to any action, immediate or prospective. We are simply trying to get both of the combatants to agree not to drag China into anarchy—a thing to be deprecated by all the world. Yours faithfully,

"JOHN HAY.
"DEPARTMENT OF STATE,
"WASHINGTON, February 13, 1904."

The object of the *Herald's* editorial is to emphasize that American policy at that time was identical with that which influenced our participation in the recent war against the central powers ; "association and co-operation without alliance." "Suppose," asks the *Herald* "he had proposed a cast iron treaty contract, to which the United States was a party, establishing a joint guaranty of China's neutrality and integrity during and after the war then beginning. That would have been an alliance and a committal on our part to military action, if necessary, to safeguard administrative entity. It would even have been an agreement to engage in war operations, if necessary, to compel China to remain neutral; and what would have been our plight, after having guaranteed China's neutrality, if, through an upheaval of Chinese sentiment unfavorable to foreign participation in her affairs, she should have refused to remain neutral ?"

Well, we ask, what is our plight now ? Is Count Witte a reliable witness ? Did Sazanoff speak the truth about Russia's committments with China ? Up to date there has been no denial of the facts so revealed. Viewed in the light of these disclosures, does not John Hay's anxiety about the "open door" in China in 1898 and 1904 tell us that the United States was sitting in a game in which the cards had been stacked by the player we were protecting from being fleeced ? Here we were talking about the "open door" and insisting upon the maintenance of the neutrality of Russia's ally, who had secretly created the situation which made the war with Japan possible. The facts should teach Americans not to take too much for granted in dealing with China, for although we can depend upon the straightforwardness of the masses of the people, our altruistic policies designed for their protection are continually set aside and ignored by a group of self-seeking mandarins who have played the game with fifty packs of marked cards concealed up their sleeves.

We repeat, if American editors and statesmen are to continue to ignore historical facts and persist in approaching the Far Eastern problem from the sentimental standpoint of five years ago, before new light was shed on these matters, there can be little hope of ever understanding the viewpoint of Japan or arriving at a proper appreciation of China's troubles.

The Reason for John Hay's Mistake

John Hay's mistake was due to the same conditions that now confront the Pacific conference, the utter absence of any organized or stable authority in China; the existence of a close clique or cliques of mandarins and military chieftains who recognize no responsible head ; a loosely-knitted aggregation of boodlers in which each high official takes upon himself the responsibility for compromising the nation in some special deal for his own profit with other powers. As Li Hung-chang cooly pocketed the bribe of Count Witte and secretly affixed his name on the dotted line to a treaty of alliance that he hoped would bring about the downfall of Japan, so, in countless similar instances, other officials have signed away the rights of their countrymen in order to increase their own well-being. Rarely, indeed, has it been possible during the past twenty years to deal with an organized government in China. Such financial deals as have been negotiated invariably have been the private perquisites of the officials concerned, without regard for the higher interests of the country or its people. China to-day faces the conference in the same position, so that many important American newspapers are asking the question, "What is China." The *New York World* answers the question thus :

"The China that exists, the China whose problems are vexing the conference, is hardly more than a 'geographical entity whose boundaries are not clearly established. There is no Chinese government that can speak for the Chinese people and act in their name. Nominally there are two governments, which are at war with each other—one in Peking and one in Canton. Whether either of them is a real government capable of performing any of the accepted functions of a government is a debatable question. The actual power in China seems to be in the hands of provincial governors whose allegiance is to themselves and who recognize a central authority only when such recognition happens to suit their purposes.

"It is all very well to talk about pledges to respect the integrity of China, but what is the China whose integrity is to be respected ? It is likewise well to talk about the 'open door,' but the 'open door' cannot be maintained by foreign influence alone. There must first be a Chinese government that can keep the door open, at least to the extent of not secretly yielding to foreign pressure and making itself the tool of foreign intrigue."

The Times (London) Peking correspondent gives a more accurate answer to the question in an article published in *The Times* of November 11. He says :

"In effect there are a dozen different governments in China, some entirely independent of each other, some recognizing others and having relations of a kind. Two are formal governments, the others are informal, but none the less organizations controlling large areas of territory without reference to any other authority."

The Times correspondent then goes on to describe the so-called central government at Peking, which operates with a president and a cabinet but without a parliament, whose constitutionality is admittedly irregular, but is upheld by the foreign powers who maintain the fiction that it rules the country. Then there is the Canton government boasting a president, a cabinet and a parliament, but with which the foreign powers will have nothing to do. Then there is Marshal Chang Tso-ling who dominates the Peking government from Mukden, the capital of Manchuria, a gentleman with a record, who has his own foreign office, his own armies and arsenals and rules as an autocrat pure and simple. In Yunnan and Szechuan are provincial governments owing allegiance to nobody. Central China is ruled by General Wu Pei-fu, who was looked upon as the "Hope of China," but who seems to have joined the jolly company of predatory tuchuns, acting independently of Peking and commandeering railway and other revenues of the central government because it failed to remit funds to pay for his campaigns. In various other provinces the military commanders are really independent autocrats, rendering lip-service to Peking but doing

as they choose. To illustrate the general situation it may be stated that during the past 15 months there have been four distinct wars in the country, èach involving not less than 100,000 troops, in Chihli, in Kwangtung, and Kwangsi, in Hupeh and Hunan and western Hupeh.

Such is China. If it were not for the existence of the consortium and the iron-clad agreement between the international banking groups to refrain from lending funds to China until a stable government is organized and operating, it is safe to say that at the present writing there would not be enough of China's resources and administrative independence left to worry about. The "door" that Americans are so strenuously trying to maintain open would be slammed to, barred, bolted, locked, buttressed and riveted in their faces. Not one of these tuchuns but would hypothecate every available source of revenue and right to obtain the wherewithal to strengthen his position and extend his influence. We have only to read into the many such agreements that have been negotiated during the past few years, culminating in the contract between Dr. Sun Yat-sen and an American syndicate to understand just how much the Chinese mandarin cares about the American doctrine of the "open door" when they are out after the cash for political adventures. This, then, is the China that we must reckon with, as distinct from the China that is held up to our gaze by the western-educated delegates at Washington, and the masses of earnest returned students and merchants who are laboring to give effect to other ideals.

And with these conditions well in mind, the *New York World* concludes a most able editorial on the situation in the following words:—

"The first obstacle that lies in the way of a settlement is the failure of the Chinese people to establish a responsible government that can protect Chinese rights and at the same time carry out Chinese obligations. It is plain enough that before there can be a permanent agreement about any vital question pertaining to the Far East a way must be found to help the Chinese people put themselves on their feet politically. This is no easy task. It cannot be done unless the Western nations are willing to assume responsibilities and also give concrete proof of their good faith.

"They cannot very well insist that Japan must make all the sacrifices. We know very well what our attitude would be if 400,000,000 Chinese without a real government were only a few miles from the borders of the United States and we were dependent on that China for part of our food supply and the raw materials necessary to the very existence of our industries. If we stop for a minute and think of all the fuss we have made about the failure of Mexico to maintain a responsible government we can get a better notion of the attitude of Japan toward a population at least six times greater than her own.

"The test of any Far Eastern agreement at Washington will be the treatment accorded to China, but China cannot be saved merely by stabilizing the loot or arriving at an understanding as to the exact amount of foreign aggression that will be regarded as not detrimental to the interests of the other nations concerned. There must be a geographical China whose integrity is guaranteed, and means must be found to aid the Chinese people in establishing a political China that can perform the functions of government. How far are the nations represented at Washington prepared to go along those practical lines?"

China's Claims at the Conference

IN this hopeless state of disorganization, China presented her claims to the Conference in clear and forcible language.

She asked that all agreements that hamper her freedom and encroach on her sovereignty be abrogated. She wants her territorial integrity respected, foreign customs control and post office control abolished, Shantung freed, Japanese rights in Manchuria defined and limited, extraterritoriality enjoyed by other nations abandoned, foreign troops removed, her neutrality in future wars guaranteed and her national resources left in her own control. In a few words, she wants to run her own affairs, and she wants the system of exploitation and conquest to cease.

These were most ably presented by Minister Sze as head of the Chinese delegation, and embraced in the ten following principles:—

1. (*a*)—The powers engage to respect and observe the territorial integrity and political and administrative independence of the Chinese republic. (*b*) China upon her part is prepared to give an undertaking not to alienate or lease any portion of her territory or littoral to any power.

2. China, being in full accord with the principle of the so-called "open door," or equal opportunity for the commerce and industry of all nations having treaty relations with China, is prepared to accept and apply it in all parts of the Chinese republic without exception.

3. With a view to strengthening mutual confidence and maintaining peace in the Pacific and the Far East the powers agree not to conclude between themselves any treaty or agreement directly affecting China or the general peace in these regions without previously notifying China and giving to her an opportunity to participate.

4. All special rights, privileges, immunities or commitments, whatever their character or contractual basis, claimed by any of the powers in or relating to China, are to be declared, and all such or future claims not so made known are to be deemed null and void. The rights, privileges, immunities and commitments, now known or to be declared are to be examined with a view to determining their scope and validity and, if valid, to harmonizing them with one another and with the principles declared by this conference.

5. Immediately, or as soon as circumstances will permit, existing limitations upon China's political, jurisdictional and administrative freedom of action are to be removed.

6. Reasonable, definite terms of duration are to be attached to China's present commitments which are without time limits.

7. In the interpretation of instruments granting special rights or privileges, the well established principle of construction that such grants shall be strictly construed in favor of the grantors is to be observed.

8. China's rights as a neutral are to be fully respected in future wars to which she is not a party.

9. Provision is to be made for the peaceful settlement of international disputes in the Pacific and the Far East.

10. Provision is to be made for future conferences to be held from time to time for the discussion of international questions relative to the Pacific and the Far East, as a basis for the determination of common policies of the signatory powers in relation thereto.

Although denied by the Chinese delegation, the correspondents of various important newspapers in America and Europe assert that the ten principles were drafted by Ex-Secretary of State Robert Lansing and Ex-Minister Paul S. Reinsch, working jointly as high advisers to the Chinese delegation. These ten points, according to these advisers, were intended to be applied as follows:

1. This proposal is intended to be a reaffirmation of the extent of the territory of China as it existed when formal recognition was made of the Chinese republic in 1913 and an effort to cancel all private agreements wholly Japanese in regard to certain portions of China. Agreement on this principle would prevent China being defined as within the great wall and would give her Manchuria and Mongolia as part of her geographical limits. Sub-section (*b*) is a rider to the first statement and is a pledge on the part of China that she will not alienate territory or lease any littoral and, further, that she will expect every power to support her in this position.

2. China seeks under this head to have the same principles applied in all parts of China, with Manchuria and Mongolia considered as integral parts of China, and wishes to give precisely the same status to all powers in her domain and to abolish the idea of spheres of influence and interest.

3. This principle is intended as a direct assault upon the Anglo-Japanese alliance, the Lansing-Ishii agreement and the so-called secret treaties of 1917 made between the powers without the knowledge of the United States upon the subject of Shantung. This is regarded as the keystone of all the proposals.

4. This principle is intended simply as a call or demand that every agreement or understanding of whatever nature touching upon anything Chinese made between powers shall be declared at Washington, and that here shall be inaugurated open diplomacy regarding the Far East and that hereafter everything shall be known as to the relations and treaties enjoyed by different countries. As an illustration of this, it is suspected by the Chinese that there is a secret agreement between Japan and France regarding the Eastern Railroad in Northern Manchuria.

5. This principle is intended to bring about the revision of all treaties dealing with extraterritorial jurisdiction, and finally to remove the conception that China is a mere treaty territory.

6. This principle seeks to establish another of the things greatly desired by China—tariff autonomy and the right to levy tariff duties on imports the same as any other country. At present China can only impose a tariff of 5 per cent. *ad valorem* on incoming products under treaty agreements, which have been in existence eighty years and have not been disturbed, despite changed conditions and the need for greater revenue. The fact that China cannot increase her tariff duties, the Chinese delegates assert, has prevented her going ahead in many ways, even though it gives equal opportunity to all countries.

7. As to the principle laid down in this proposal, the contention is set up that China should have the same powers in regard to her railroads, mines and concessions generally as obtain in all Western countries, and when circumstances arise the universal world practice shall be followed in favor of grantors. In effect this principle is intended to eventually give China the control and ownership of her railroads.

8. This is intended to serve notice on the world that China shall expect the powers to preserve her neutrality in a war in which she is not a part. This principle is inspired by the action of Japan in not observing the war zone laid down by her when Japan landed forces in Shantung and prosecuted military operations against Kiaochow in 1915 when Japan declared war against Germany. Instead of operating in the war zone the Japanese sent military forces first to Weihsien, which was outside the war zone, and to Tsinanfu, the capital of Shantung, thus occupying the whole line of railway to the capital. Tsinanfu is 256 miles from Kiaochow.

9. Proposes an arbitration commission to deal with the Far East similar to an agreement made between the United States and Great Britain in September, 1914, for the creation of a peace commission.

10. This principle is self-explanatory and calls for conferences from time to time to discuss international questions relating to the Far East.

From one point of view these principles constituted a challenge of the part of China to the good faith of the powers and means, and as the *Brooklyn Eagle* points out, "France and England as well as Japan must surrender certain privileges they enjoy and have long enjoyed, that the fruits of iniquitous wars in the past, as well as of iniquitous bargains must be surrendered to their real owners. The demands made by China will be hard to reject, the arguments she advances difficult to answer. The sympathy of the United States will be with the Chinese." From another viewpoint these ten principles so equitable and just on their face will not stand close scrutiny in the light of actual facts. The explanation given to Clause 1 by the high adviser to the Chinese delegation loses strength when it is recalled that at the time the Chinese republic was recognized in 1913, Mongolia had been a free state for over a year and a half, and ignores completely the part played by Japan in restoring Manchuria to China after the latter had practically surrendered all authority to the extent that Russia intended to turn it into a closed state like Bokhara or Turkestan. It loses sight of the further important fact that the independence of Mongolia proclaimed in 1911 was to have been employed by Russia as the means of extending her strategical railways for the further conquest of China and renew the conflict with Japan. The less China and her advisers have to say about Manchuria and Mongolia being at all times an integral part of the Chinese nation, the better, for the statement stands, defying refutation, that her sovereignty over these territories, such as it is, has been upheld and saved to her by Japan after she had surrendered them over to Russia in order that the latter might more readily crush Japan.

Naturally, with such palpable contradictions brought before the conference, the questions which obsessed the delegates more than anything else were: "What is the 'open door?' " "What is China?" "What is it that China wants?" "Who is menacing her integrity?" To reiterate the hackneyed accusation that Japan is the one predatory power encroaching on China's integrity, after she has saved and returned these territories to her and stands compromised to the maintenance of her sovereignty and the operation of the "open door" doctrine in these identical regions, seems like repeating the error of Versailles in trying to convert the conference into a court for the trial of Japan.

Japan's Cards on the Table

THERE would be little use in analyzing all the ramifications of the ten principles advanced by China as a solution to her problems, as the big issue as far as the conference is concerned, centres in Japan's claims in Manchuria and Mongolia, and here we must give close attention to the policy of Japan as outlined by Baron Shidehara to the correspondent of the *New York Times.* The main features of the Japanese position relative to the problems before the conference are set forth as follows:

1. The free and peaceful development of the commerce of Japan, the United States and other nations in the Pacific.

2. Support by all pacific means of the independence and integrity of China and the privilege of equal opportunity and the open door for the commerce and industry of all nations in that country.

3. Withdrawal of Japan's forces from the leased territory at Kiaochow, in the province of Shantung, on a basis which Japan hopes will be satisfactory to Great Britain and the United States and fair and acceptable to the Chinese.

4. Neither the annexation of nor a protectorate over Manchuria, but recognition of the principle that Japan has special interests there, based on considerations of propinquity, vast railway and other investments, and the considerable Japanese population that has penetrated into the region along the railway from Dairen to Changchun, these special interests being regarded by Japan as heightened by the fact that Manchuria stands in the path of possible future Russian aggression against Japan.

5. The open door and equality for other nations in both Manchuria and Siberia.

6. Neither annexation nor protectoral control of Siberia, but recognition of the principle of peaceful penetration of Japanese into that region for purposes of trade and commerce, to obtain raw material, and sell Japanese surplus manufactured products.

7. Withdrawal of Japanese forces from Siberia as soon as there is organized in the Russian Far Eastern maritime province and Siberia a government qualified and able to stabilize conditions, and in particular to afford protection to Japanese settlers, fishermen and other subjects of Japan resident there.

8. The hope and expectation of the Japanese that when Japan withdraws from the leased territory of Kiaochow and Tsingtao, the British will also withdraw from the leased territory of Wei-hai-wei, which is likewise in the Chinese province of Shantung.

9. The acceptance by China of the new international four-power consortium, in which the present participants are American, British, French and Japanese banking groups, with the object of negotiating and carrying out Chinese foreign loan business and assisting China in the establishment of her great public utilities with the co-operation of Chinese capital, but with consortium control and supervision to insure correct expenditure of foreign loans and to eliminate the possibility of the money being wasted or misapplied through corruption.

10. The stabilization generally of financial, economic and political conditions in China with a view to closer commercial relations between China and the outside world, China being regarded by Japan as one of the main sources of raw material sorely needed by the Japanese and as a market in which to dispose of Japanese manufactured products, without exclusion of or discrimination against other nations desirous of developing business and commercial relations with the Chinese.

11. The maintenance of the *status quo* in the Dairen leased territory and of the Japanese leased zone along the South Manchurian Railway.

12. Less concern over the renewal of the Anglo-Japanese alliance, which is not regarded as being so vitally necessary in view of the pronounced tendency of the Washington conference toward an agreement for sweeping reduction of naval armaments of the three leading naval powers.

13. Solution of the Yap question and the problem of trans-Pacific communications on a basis satisfactory to the United States and Japan and with the endorsement of the other governments interested in Pacific communications.

Thus did Japan reiterate and emphasize her oft repeated declarations defining exactly what she wants in Manchuria and Mongolia, a policy forced upon her by the attitude of other nations whose doors are closed to her people, compelling them to remain at home and seek their future on the Asiatic mainland. In other words, Japan says to the world, "we want a chance to live peaceably and exist honorably by a recognition of our special strategical and economic necessities in regions which we have saved to China at the expenditure of rivers of blood and treasure. We do not ask that China surrender one iota of her sovereignty, other than that which she willingly parted with in the South Manchuria Railway lease to Russia. This we must retain because of the fact that Manchuria stands in the path of possible future Russian aggression against Japan, and China is too disorganized and weak to guaranty her neutrality."

Naturally, Japanophobe Chinese and their American advisers, whose one-sided diplomacy created many of the issues the conference is now called upon to disentangle, see even in this explicit declaration of Japan, a hidden threat against China's future integrity and are moving heaven and earth through propaganda to create the impression that Japan is seeking to amputate these regions from the rest of China proper. It is inconceivable that Japan would go before the conference seeking to infringe either the sovereign rights of Russia or China, and the imputations of bad faith hurled against the Japanese are most untimely, certainly injurious and unjust.

Dr. W. W. Yen, China's foreign minister, hastened to declare the attitude of his government in an article published in a local weekly, and his views were accepted as meaning that China, as a last resort, will accept partial financial control, preferably by a Chinese foreign budget commission, but that she will never consent to Manchuria's alienation from the remainder of China.

Mischief Makers Busy

The mischief-makers lost no time in getting on the job, and we find ex-Minister Reinsch rushing to the front (page of the newspapers) to again warn the American people that war is inevitable. At the annual dinner of the Society of Colonial Wars, held in New York, referring to Japan's "obnoxious activities" in China, Dr. Reinsch indicated that America should prepare for war in the event the Far Eastern problems were not disposed of at the conference, adding that the Chinese rely chiefly on America to see that they get a square deal. Dr. Reinsch probably overlooked taking the audience into his confidence that he was one of the high advisers to the Chinese delegation and that her case, according to well-informed correspondents, had been drawn by jointly by him and

Mr. Lansing. In other words, unless the United States adheres to the policy laid down by Dr. Reinsch and ex-Secretary Lansing who created many of the issues through their man-handling of American diplomacy during the war, we must fight Japan. A little congressional investigation into the diplomacy of Minister Reinsch during his incumbency of office at Peking might reveal to the American people very good reasons why he should explain the raising of issues at a time when the nation was in no position to support him.

It is easier now to understand the inside working of the clique who hoped to manœuvre the United States into a position where war with Japan would become inescapable, in order to give effect to their conception of American policy in China. We can go back to the days of the Paris conference, where the chief American expert, on hearing of the Shantung award, is alleged to have declared. "THIS MEANS WAR." Mr. Millard, who disclosed this undiplomatic break, was accompanied to Washington by Mr. Eugene Chen and other young Chinese, who lent their energies to supporting Mr. Millard in his declarations. We mention Mr. Chen at this time, because he has recently produced further evidence that the Chinese and their Japanophobe friends seriously consider these matters as a war issue between Japan and America, mind you, not between China and Japan, but Japan and America, and, if by any chance, Americans fail to recognize this and permit Japan to have her way, then, in due time, China and Japan will fight us.

The Pan-Asiatic Bogey

MR. Chen, as the representative of the southern government at Canton, has contributed some highly interesting and enlightening articles to the local press about the issues at stake between North and South China, and although we heartily sympathise with many of the principles so ably expounded and would wish with all our heart to see his ideas realized, yet we must take issue with that part of his arguments which advocates American naval power as a factor for China's security. In elucidating the Pacific question, Mr. Chen breaks his argument into a series of numbered statements, viz.:

(1). Japan frankly claims that her territorial expansion is a national necessity in order to secure room for her surplus population.

(2). It is admitted that such room is available in Australia and in America. But certain considerations of high policy forbid the entry of Japanese immigrants into those lands.

(3). Hence, the thesis which insists that the existing *status quo* in the Pacific shall be fundamentally altered in favor of Japanese emigrants.

(4). It is believed that such a solution of the Pacific question could only be effected by a Japanese victory in a war with America.

(5). It is plain, however, that Japan could not vanquish America if she had to rely on her own resources. But it is equally plain that she could do so if Chinese man-power and Chinese natural resources were at her command. China exceeds Europe in area, population and, probably, natural resources. Hence, the *raison d'etre* of Japan's policy in China.

(6). It is also a term of the argument that Japan's real aim is masked in the contention that she seeks in China only room for her surplus population and the raw materials without which her industries would perish. But intra-mural China is over-crowded, and the conditions of life in extra-mural China—Manchuria and Mongolia—are not suitable for genuine Japanese, as distinguished from purely political, colonisation in those regions. As regards raw materials, these are and will always be available to Japan through the ordinary channels of international trade and commerce.

(7). These considerations, therefore, seem to support the view that Japan's policy in China aims at the domination of China with her man-power and natural resources in order to enable Japan to force open the gates of Australia and America to Japanese immigration.

Here we have in plain words from one of the foremost Chinese writers of the day, a clean confession of China's weakness, an admission that his countrymen, once disillusioned of the idea that the United States will act as their guardian, will ally themselves with the Japanese for forcing open the doors of America and Australia to Chinese and Japanese emigration. This argument tells us in no uncertain language that the Japanese are not wanted in China under any consideration, and we come back to the question of where are they to go, how are they to live ? If all the other countries bordering the Pacific close their doors to the Japanese and Chinese, and China insists that her neighbors cannot enter her domains, and the Japanese keep on increasing, then we arrive at precisely the situation we have tried to impress upon Americans. If the Japanese are barred from freely entering Asia through the hostility of China in territories that Japan has saved for her, and she is strong enough to make it stick, then some day the racial issue will be forced over the Pacific for the boys of America and Canada to settle, and that day will find China solidly lined up on the side of Japan. In other words, the policies of Russia and China would force the racial issue which belongs in Asia over to the shores of America, and if Americans insist upon having the question settled where it rightfully belongs, then China will permit herself to be led by Japan and retaliate by forcibly opening our doors to the hordes of Asia. According to these thinkers there is no escape for America. Willy-nilly we must fight Japan or a Japanized China will some day get us if we don't look out.

China's Threat to America

Chinese writers who flaunt the Pan-Asian bogey to scare Americans only make the case worse for themselves, for if present-day talk carries any weight, the first thing a militarized China would do would be to throw out their Japanese overlords and square accounts with Russia, and here they would have all they could attend for a generation or so without planning to force open doors thousands of miles away over an ocean guarded by the fleets of the white races. As long as America, Great Britain and France retain supremacy of the seas, we will lose no sleep over the arguments advanced by Mr. Eugene Chen to frighten Americans into becoming China's permanent guardian. Dr. Wellington Koo and others tell us in one breath that the future peace of the world depends upon a strong China, whose people with their pacific tendencies can be depended upon to do away with militarism and wars of aggressin, and in another breath we are told by equally prominent Chinese, that if America don't protect them against Japan, then, we must accept the consequences.

Mr. Chen, as spokesman for the Chinese who insist that America must fight Japan (an opinion also shared by his colleague, Dr. Ma Soo, the Canton delegate at Washington) insists that a mere limitation of armaments, especially American naval power, cannot solve either the Chinese or the Pacific problems, for then Japan's ability as the greatest military power in Asia to prosecute her policy of ascendency in China would be increased, not diminished.

"On this view" says Mr. Chen, "America would be faced with the political paradox of working the gravest injury to China whilst genuinely trying to assist her. But it would not be the first time. That paradox was seen in the Knox scheme of railway neutralisation in Manchuria ; and it was repeated in the policy which brought China into the great war and sacrificed her at Versailles. And the same paradox will reappear so lung as it is not realized that the future of China is a vital—not an altruistic—concern to America.

"If the future of China is rightly envisaged as a vital American interest, you will see the cogency of the related view that a limitation of American armament must be supplemented by the strengthening of some internal stabilising force in China unless the intervention of America is to worsen the present grave state of the country.

"In terms of practical politics, such a stabilising force must take the form of a national government."

Quite right. But who is to undertake the task of stabilization ? What shape should this intervention take ? The future of China is primarily a vital Chinese interest, and if this is to come from some stabilizing force from the outside, which faction in China is to be supported ? Can foreign nations be expected to do something for the Chinese they are incapable of doing for themselves, and if so, can any one foreign nation, especially America, take on its shoulders such a herculean task ? Mr. Chen is advancing a strong argument for intervention, a plea to give practical effect to that phase of the Hay doctrine so forcibly outlined by Minister Schurman in his Peking speech. Here we have the spokesman for one element of Chinese political life advocating a policy strenuously opposed by other equally important elements. If such a proposal was seriously advanced by a foreigner, the Chinese would come together as a unit to repudiate it, as happened at the very outset of the conference, when it seemed that such a solution

might be urged on the delegates. If China is to be preserved as a national entity and a stable national government created in order to offset the decrease in naval armaments and provide a military check upon Japan, then the job is one that the United States could not undertake without inviting the very thing that the conference was called to avoid. In other words, the argument remains that the only salvation for China consists in the United States going to war with Japan. It is a remarkable fact that all the Canton publicists are a unit on this point. It would seem more practical, that the stabilizing of China should be a task for all the interested consortium powers, who would have to undertake definite responsibilities and obligations, financial in the beginning and not impossibly political in the end. The United States would never undertake this job alone.

"Sold to Japan"

THE mere fact that an American differs from these radical Chinese views or challenges the American Japanophobes who carry out their propaganda, brings upon him the charge of having "sold out to Japan." The Chinese have become so accustomed to being told that America will fight their battles for them, that any deviation from this solution to the question is denounced as anti-Chinese and unpatriotically American, and efforts have been made to discredit whoever dared to run counter to the ideas of the inner ring dictating American policy in these matters. This phase of the intrigue to railroad the United States into a war with Japan would make extremely interesting reading for the people of the United States, could all the facts be correlated and placed before them. The audacity of these mischief-makers was again witnessed when the report was circulated early in the conference that the "United States had sold out to Japan," simply because the level-headed people of America were asking embarassing questions about the inner facts of the controversy between China and Japan and seemed for once to extend a little sympathy to the latter country in her dilemma. Needless to add, that the Washington authorities immediately served notice on certain Chinese at the conference that such tactics on the part of their numerous publicists was resented as an insult. We have heard no more about America selling out to Japan. This is simply another angle of the campaign designed to compel the United States to fight Japan, made possible by such diplomats, who like Dr. Reinsch and others in the service of Peking or Canton insist that war is inevitable unless the nation supports them in solving difficulties they were largely responsible for creating. No wonder, that when such high representatives of a former administration talk in this strain and permit themselves to be quoted, and predict on the speaker's platform that war will happen within ten years, and American publicists in the service of China boast that they will bring this war about, that the Chinese and the ordinary American man-in-the--street began to believe that this was the only solution.

"Discrediting" Lamont

IT is a matter of congratulation, however not only for China but the rest of the world, that the Pacific atmosphere is being cleared, and as the mists of misunderstanding are blown away by the clean air of truth, Japan is revealed to Americans in a light which compels sympathy and respect. The personalities of the mischief-makers are being disclosed. The trick of abusing and impugning the integrity of everybody who disagrees with them is reacting like a boomerang upon China's foremost advocates. The attempt on the part of Mr. Lennox Simpson to place in question the integrity of J. P. Morgan & Company in the matter of the German Hukwang bonds has left a bad taste in the mouth of Americans, and there is talk of a congressional investigation. It is a pity that such an investigation into the conduct of our affairs in China could not have been ordered two years ago. The present conference might not have been necessary. That, however, is another story. Mr. Simpson, as one of the advisers to the Chinese government, alleged that J. P. Morgan & Co. sought to make the payment of interest on the German Hukwang bonds contingent upon the negotiation of a new loan of $16,000,000 to redeem the principal and interest on the loan due the Continental and Commercial Trust Company of Chicago, which matured on December 1st and was defaulted by the Chinese government. The Chinese delegates at the conference confirmed the statements made by Mr. Simpson and supplied further details of the way the German issue of Hukwang bonds came into the hands of American bankers. It was stated that all the bonds the American group and Mr. Lamont are alleged to have demanded payment upon were traced directly to German sources by the Chinese government, and shown, according to them, to have come into the possession of J. P. Morgan & Co. after China declared war against Germany and repudiated payment on the issue.

It was asserted that $250,000 of the bonds, said to have come into the hands of J. P. Morgan & Co., came directly from the Duchess of Luxemburg and that the rest of the $3,000,000 came to America from Scandinavian banks. These banks were said to have obtained the bonds from Germany in payment for war materials furnished that country.

Such a story emanating from official Chinese sources struck not only at the integrity of the American group, but at the consortium as a whole, and brought forth an immediate and vigorous denial from Mr. Thomas W. Lamont, the chairman of the consortium and head of the American group. Mr. Lamont's answer is given herewith in full:

"The intimation that the American group made it difficult for China to obtain a loan in the American market is unqualifiedly false. On the contrary, the American group, though not directly concerned or interested in the loan that fell due on November 1, made the most strenuous endeavors to assist China to meet its maturity.

"There was no particular reason why the American group should undertake to lend money to China in order to take up its outstanding loan, for the consortium was originally established not for the purpose of looking after China's current obligations, but rather in order to furnish to her from time to time as she might require them fresh funds for actual constructive purposes, such as currency reform, the building of railways, etc. Because, however, word was received from Peking to the effect that the government might have difficulty in meeting its nearby maturities, the American group endeavored to formulate a plan whereby such maturities would be cared for and sufficient funds advanced to China to enable her to remedy her failure months ago to pay the coupons upon certain of her outstanding Hukwang railway bonds.

"These bonds had been originally issued in Germany, but had apparently even before the great war fallen into the hands of innocent holders in other countries, and China's failure to meet the coupons as presented by those innocent holders had resulted in injuring her credit here; so the American group felt that any new issue would be more than doubtful of success unless funds were provided to enable China to cure her default. The intimation that these past due Hukwang coupons constituted a claim on the part of our firm is entirely without foundation, as neither we nor, so far as we are aware, other members of the American group are holders of these bonds."

Mr. Simpson, in his zeal to aid China made the same impression in the United States that he did in England, where, according to press reports, the British government requested that his activities be curtailed. His attack upon J. P. Morgan & Company is declared by American bankers to be inspired by a desire to arouse China's opposition to the consortium and in doing so, he deliberately ruined China's credit in the American investment market at a time when she is in desperate need of money with which to rehabilitate herself. On the other hand, it is easy to see that this attack on the integrity of the most influential American banking house is in line with other attempts on the part of China's propagandists

to besmirch the character of and impugn the motives of any American who has a good word to say for Japan. In the eyes of China's advocates, Mr. Lamont has been the greatest obstacle to the success of their campaign, by his open advocacy of co-operation with Japan. "Pressure must be brought to bear on these highly placed Americans who adhere to this policy, in order to compel them to modify their views," we were informed in Peking. Perhaps Mr. Simpson sought to apply the pressure, and offset the strenuous efforts of Mr. Lamont, Judge Gary and others to clarify the atmosphere.

The Boomerang

IF so, the attempt failed for only a week after this episode, Mr. Lamont had occasion to once more challenge the veracity of the Chinese propagandists who insist that war is inevitable and that Japan is seeking to establish her supremacy in Asia irrespective of the rights of all other nations. This opportunity came at a huge banquet attended by over 800 people, given by the Japan Society in New York to the members of the Japanese business men's party then in that city. After emphasizing the point that business men and bankers do not profit from war and its preparation, he sent this solid shot into the cohorts of armageddon:

"There are on both sides of the Pacific mischief-makers, and it is our business to thwart such people and such newspapers as breed suspicion and envy and rancor and fear. We here of the Japan Society take it upon ourselves day by day and year by year to correct misstatements and misconception as to Japan.

"We deny that the Japanese people desire to conquer Asia. We deny that they will fight to dominate the Far East. We assert that they are a peace-loving people, of noble tradition, living in a bountiful land, themselves imbued with ideas of beauty and art and earnestly desirous of cultivating their civilization free from warfare and strife."

This gives the direct lie from the most prominent American banker and his business associates to the pernicious campaign that has been waged since the Versailles conference to manœuvre the United States into a position where war with Japan could not be escaped. It is the answer of sober-minded America to the paid clap trap of the clique that would plunge America into hostilities in order that it may maintain prestige and position with its Chinese paymasters. It carries the message to Japan that there exists in the United States a strong and influential element who will oppose to the utmost the damnable propaganda that war rather than co-operation is to be the climax to our misunderstandings. No honest man could impugn the good intentions and sincerity of the Japanese business men who responded to Mr. Lamont's declaration of good will.

Replying to the warm welcome extended to him and his associates Dr. Dan of the great Mitsui firm said:

"We are exceedingly anxious that your judgments should not be influenced or led astray by the propaganda of mischief-makers. The mutual prejudices created and held for centuries in the mind of peoples should now be dispersed and we all, Westerners and Easterners, should meet on the common ground with reciprocal confidence and hearty goodwill."

The differences between Japan and America are shallow, the voices which whisper of trouble are weak. Ex-Secretary of Commerce Redfield said in urging closer relationship between the countries. Baron Nakashima, Manzo Kushida and Umekichi Yoneyama and other speakers explained their mission to be one of furthering better understanding and closer relationship and then begged of the American business man to seek to comprehend their good intentions.

Japan Asks for Justice

ASKED to cite the greatest difficulty to good understanding among the nations, Prince Tokugawa of the Japanese delegation to the Washington conference replied promptly and specifically:

"Ignorance. Lack of information. We should have more of you newspaper men traveling back and forth."

This is the kind of talk that is winning the American people over to a more sympathetic understanding of Japan's problems. Japan courts publicity. She laid her cards fairly on the table and presented her case briefly in the points laid down by Ambassador Shidehara. Japan does not want to annex Manchuria or Mongolia, she is willing to meet China fairly on the disposition of the Shantung railway. Her requests simmer down to a simple recognition of her sacrifices in preserving Manchuria to China at a time when China had surrendered her sovereignty to Russia. She does not ask for special privileges in those regions, but she does expect that these lands will be opened in some way to international development so that her people may find opportunities for their excess energies and assure to them the raw materials that will permit them to exist in their own country, and not force them to adopt race suicide when other peoples are permitted to increase, multiply and colonize vast waste spaces they have stolen from others. Mr. H. G. Wells, the eminent English writer, submits in one of his articles that "the troubles arising from excessive fecundity within a country justify not aggressive imperialism on the part of that country, but a sufficient amount of birth control within its proper boundaries." Fine! for any people who have the unlimited right to chose their home in any country or clime under the sun! Excellent! for those who have appropriated unto themselves the great vacant spaces of the world and hold them closed to others, but to deny the right of Japan to find homes for her surplus millions in Eastern Asia in lands they have preserved to the Yellow Race, and then place obstacles in their way of obtaining the food and raw materials necessary for them to exist at home, is condemning a nation to death, an invitation for Japan to commit suicide.

Mr. Chen says "that as regards raw materials these are and will always be available to Japan through the ordinary channels of international trade and commerce." But when Mr. Chen and his friends determine that America will not fight their battles and the Chinese again find some excuse to boycott Japanese goods, what assurance has Japan that her vital economic interests will be respected in Manchuria and Mongolia. What guaranty can Japan be given that food supplies and raw materials from the nearby regions of Manchuria so necessary for her existence will not be stopped through some future student agitation in which those who now talk so glibly about the free channels of trade and commerce, would be the first to obstruct the unrestricted interchange of commodities?

Is Japan Justified?

IS Japan justified in her stand regarding the vital economic importance of Manchuria to her national existence or is this simply a camaflouge argument advanced to conceal aggressive and imperialistic designs as alleged by Chinese writers? Whenever Japan has a short rice crop and is compelled to import heavily from other rice-producing countries, who are the first to accuse her of taking the food out of their mouths by purchasing on the open market her necessities? The Chinese. Who does not recall the recent hullabaloo indulged in by Chinese writers in America accusing Japan of buying up their stores of rice at exorbitant prices at a time whem millions of their own people were starving? Who does not recall that every now and then the export of cereals is prohibited in China? Where then, in the event of a great food shortage can Japan turn for her staple food? Mr. K. K. Kawakami in

explaining this necessity of Japan, tells us in the December *Review of Reviews*, that

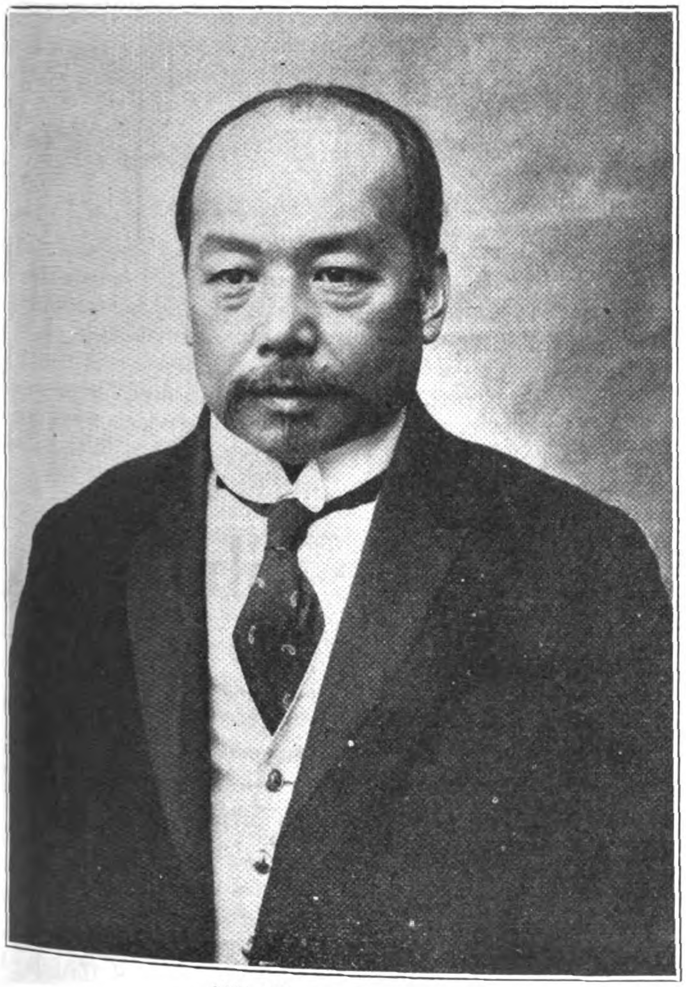
"Driven by necessity, the Japanese have been cultivating their lands so intensively that the law of diminishing return has long since begun to assert itself. Even the most painstaking application of fertilizing process cannot stay the operation of this natural law. To-day the soil of Japan is no longer capable of feeding its own population. Alarmed by this condition, the Japanese government a few years ago conducted an investigation into the possibility or impossibility of extending the area of farming land The result of this investigation was disappointing. In a word, the country offers no new land that can be opened for farming purposes."

Mr. Kawakami might have added, that the decreasing productivity of the Japanese farm is maintained as it is by the excessive use of fertilizer imported fron Manchuria. The bulk of the great bean cake exports of this territory go to Japan for use as fertilizer. Deprive the Japanese farmer of this cheap commodity, and he will be compelled to purchase the higher priced products with a corresponding increase in the cost of his staple crop. Aside altogether from all other Chinese products, any interference with the steady export of Manchurian bean cake to Japan, spells disaster to the Japanese farmer, an increase in the cost of living for the masses.

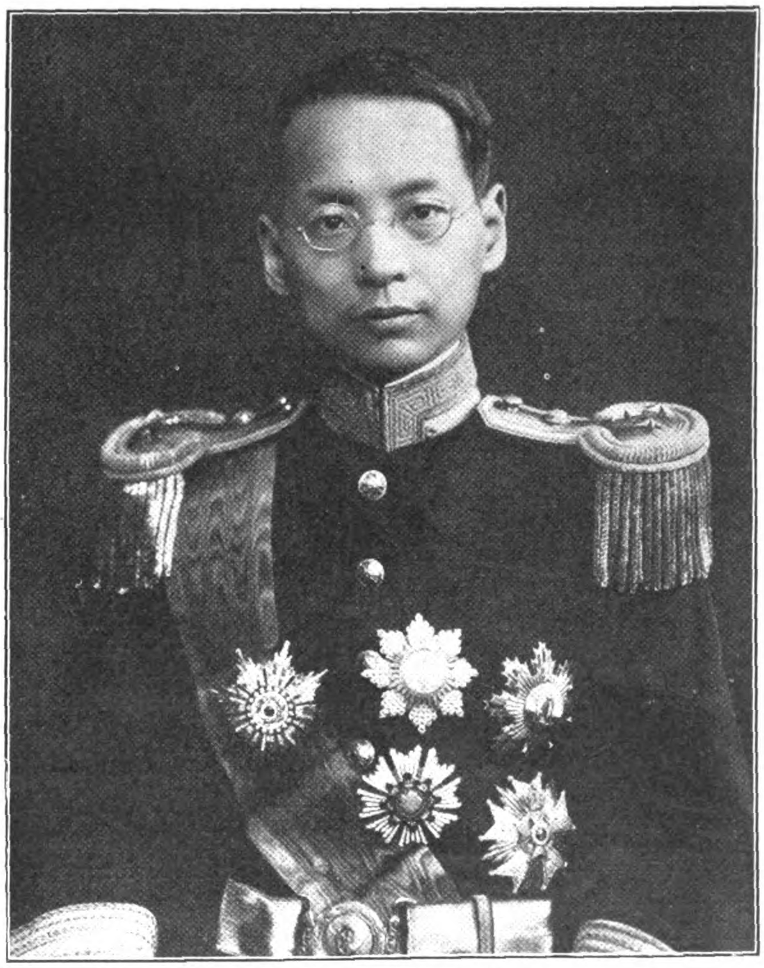
Is Mr. Kawakami correct ? Where then can Japan hope to obtain a cheap and readily accessible supply of food for her increasing millions ? From China with its frequent prohibition of rice exports ? Hardly a safe reliance for a nation of 70,000,000 people. What is the answer ? Manchuria is rich in wheat, which the Japanese are trying to induce their own people to eat as a substitute for, or a supplement to, rice. The movement is meeting with some success, but Japan has still to buy yearly large quantities of rice in foreign countries, particularly from French Indo-China.

The Japanese hope some day to make Harbin the Winnipeg of the Far East and to carry down to the sea, over the South Manchuria Railroad, the products of Manchuria and adjacent Siberia.

Japan hopes to teach her people to eat wheat and meat instead of fish and rice and these necessities can only come to her people at prices within their reach, from the nearby lands of Manchuria and Mongolia. If we try and visualize Japan's problems in the light of current Chinese antagonism, can we blame them for insisting on some solution that will keep open the door of these regions for the constant egress of food supplies and raw materials upon which the very life of Japan depends ?



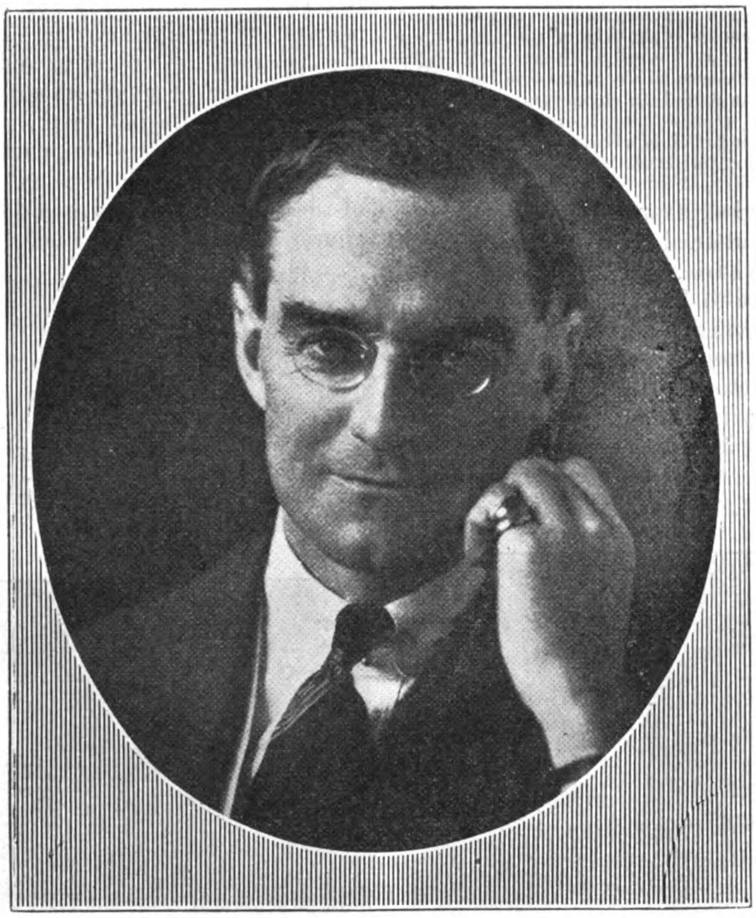
H.E. Liang Shih-yi
China's New Premier



H.E. Yeh Kung-cho
China's Minister of Communications

CHINA'S NEW CABINET

The Chinese political wheel has turned once more bringing the old Chiaotung (Railway) group into power again, with Mr. Liang Shih-yi as Premier of a cabinet backed by Marshal Chang Tso-ling and acquiesced in by Marshal Tsao Kun. It is too early to venture an opinion as to the ability of the new cabinet to steer the government over the financial rocks of the Chinese New Year and pay salaries to officials and troops. When everything looks darkest in China's finances, somebody comes through with a few millions that enables the government to hang on and save its face, until more juggling becomes necessary. Liang Shih-yi is China's most accomplished financial expert.



Mr. C. R. BURKILL,
Chairman of the Shanghai Automobile Show

The Shanghai Automobile Show

THE automobile dealers of Shanghai and the manufacturers so ably represented by them are to be congratulated on the success of their first effort to hold a show in the Far East, which proved to be equal to many held at home where every convenience is afforded to facilitate exhibits. The success of this first show has started others talking about a big industrial or engineering exhibit. This came as a natural sequence to the many exhibits of machinery and accessories that somewhat modified the character of the automobile show. As was to be expected, the show was international; all types and makes of cars and accessories being displayed. It is not our purpose to dilate on these features as they have all been fully covered by the local and other papers, contenting ourselves with a brief description of the various stands and exhibits.

No description of the show, however, would be complete without an acknowledgement of the valuable services of those who made it possible and lent their untiring energies to bring success. Those responsible for the exhibition are: Mr. C. R. Burkill, chairman; Mr. M. W. Buck, treasurer; Mr. Joseph J. Keegan, hon. secretary and Mr. Arthur West, manager.

The executive committee are: Messrs. F. P. Bills (Hudford Motors); M. W. Buck (China Mutual Trading Co., Ltd.); C. R. Burkill (A. R. Burkill & Sons); G. W. Chandler (Dunlop Rubber Co. (China), Ltd.); Leon Friedman (China Motors, Ltd.); P. W. Giovannini (H. S. Honigsberg & Co., Inc.); A. H. Hallam (Vacuum Oil Co.); H. O. Hashagen (Standard Oil Co. of N. Y.); F. Wells Henderson (Inniss and Riddle (China), Ltd.); H. S. Honigsberg (H. S. Honigsberg & Co., Inc.); Joseph J. Keegan (Motor Insurance Loss Assessor); S. C. Lee (Lee and Lee Garage, Ltd.); W. S. Leonard (U. S. Rubber Export Co., Ltd.); Ph. Osterberger (Grand Garage Francais); S. W. Pratt (Shanghai Horse Bazaar and Motor Co., Ltd.); R. R. Roxburgh (John I. Thornycroft & Co., Ltd.); R. T. Ryton (The Auto Palace Co.); E. J. Surman (Jardine, Matheson & Co., Ltd.); C. J. White (The Central Garage Co.); K. Y. Yao (Wah Chang Trading Corporation) and George Wilson (The Asiatic Petroleum Co. (N. China), Ltd.)

United States Rubber Company

STAND No. 1.

IT is superfluous to describe in detail the many varieties of tires manufactured and exhibited by this great American company, the largest of its kind in the world. It is, however, of interest to China automobile and truck owners to know that this company maintains its own special representative in Shanghai, working with the Shanghai Horse Bazaar & Motor Company, Ltd. in order to carry out the manufacturer's idea of service, especially in the matter of assisting truck users to select the proper tire for each particular use. The United States Rubber Company were quick to sense that truck users were coming to realize that tires have a very important part in successful truck operation, and that the tires are a separate problem from the truck itself. It has been hard to get sound advice regarding tires. It has not always been easy for a tire manufacturer to advise the use of some kind of equipment which he did not himself manufacture.

Take, for instance, the subject of pneumatic truck tires. The advice regarding the use of these tires has been both confusing and incorrect in nearly all cases. Many a truck owner has learned by expensive experience that the pneumatic has a clearly prescribed field, and that the use of pneumatics outside this field means the waste of money. As much money is wasted to-day they contend, on wrong tires as on poor ones. Some truck owners wonder why their tire bills are so high while others are moderate. The answer is to be found in many cases in the fact that the wrong type or the wrong size of tires has been selected.

The uses to which trucks are put are so varied and the types and sizes of tires so numerous that it is a very easy matter to select the wrong tire for some particular kind of haulage.

In the interest of greater economy, the United States Tire Company has established a technical service department, made up of tire engineers, which will give impartial, disinterested advice to everybody engaged in truck operation. A full statement of any tire problem from any truck operator in the world will bring a detailed reply from the department or its representatives giving the latest scientific information on the points involved. Making a complete line of tires, the company favors no type above another. As the largest rubber company in the world it has a large staff of chemical and engineering experts which is made available to the truck operator through the technical service department.

"We intend that the technical service department shall be used freely by every person who owns a truck," says C. K. Whidden, manager of truck tire sales of the United States Tire Company. "Whether an owner is a patron or not makes no difference, all our facilities for correct information are at his disposal.

"If some large user has a number of hard knots for solution, we will be glad to have an experienced engineer visit him for several days if necessary in order that his problems may be satisfactorily solved.

"Nearly half of the trucks of the country are operating on the wrong kind of tires. This is a condition we hope to correct."

Along these lines the representative of the United States Rubber Company in China and their other agents throughout the Far East, expect to be of service to truck users, irrespective of the make of truck they are using.

Shanghai Horse Bazaar & Motor Co., Ltd.

STAND Nos. 2, 3, 4

THIS company features the Rolls-Royce, Studebaker, Fiat and Maxwell cars. The Rolls-Royce limousine on exhibition is undoubtedly one of the finest cars on the floor. The chassis was shipped from the company's works in London, but the body was built and upholstered at the local works of the exhibitor. The sides are of aluminium with welded joints, and moulding of Chinese redwood. Silver-plated fittings, electric speaking apparatus and other high-grade accessories complete this luxurious car.

The engine of 40-50 horse-power is a six cylinder vertical type suspended on the frame by a patented device, which allows the members of the frame relative movement to one another for the negotiation of rough roads without involving extra strain on the arms of the crank chamber. The cylinders are cast complete in groups of three and the valves are arranged along one side of the engine and are operated by a single cam shaft. The inlet and exhaust valves, of high chromium steel, are interchangeable. The induction and exhaust valves are operated by means of rocking levers pivoted at one end, and fitted at the other with a roller lying between the valve spindle and the cam. These levers are fitted in pairs, one inlet and one exhaust, mounted on one base, and attached to the crank chamber by studs. The introduction of the roller and lever eliminates the side pressure exerted on the lifter slides when cam and tappet rod come into actual contact. The carburetter is of the float feed spray type, fitted with a special automobile valve, which accurately adjusts the carburation for all speeds of the engine, and enables the engine to run "dead-slow," with a maximum of torque when required.

THE FIAT TRACTOR.—Although not exhibited at the show, the new Fiat tractor is one of the most promising machines for the Far Eastern market, especially in regions, where like Manchuria, Siberia, Philippines, Siam, the F.M.S., Dutch East Indies and Formosa, agriculture is conducted on an extensive scale. These machines have just completed some severe tests in competition with makes of all other countries with great success.

One of these Fiat machines ploughed 0.69 acres an hour to a depth of 7 inches with the use of only 15.3 pints of paraffin per acre. On the drawbar tests the pull to skid the wheels was 3,500-lbs., and the sustained pull of the Fiat was 3,000-lbs. On the belt test the brake horse-power at a belt speed of 2,200 feet per minute was 26.2, and the maximum brake horse-power was 27.5.

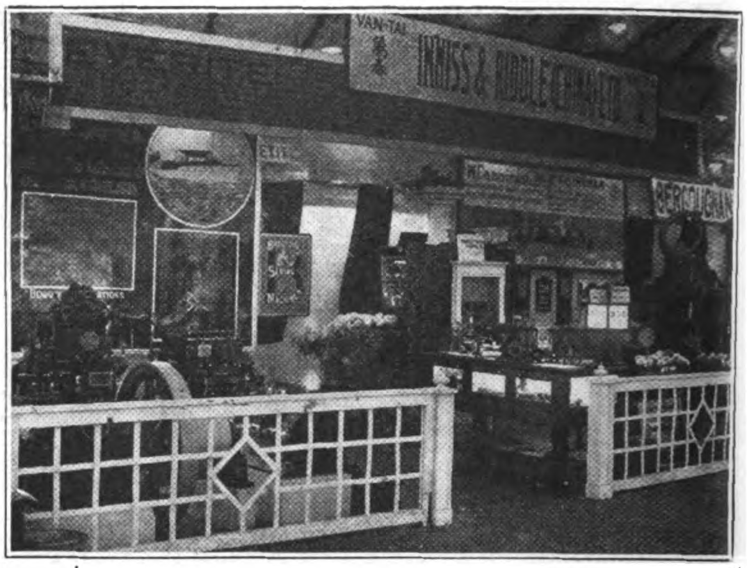
One of the features of the trials was the use of French national fuel composed of 50 per cent. benzole and 50 per cent. alcohol, whose use is recommended by the government in order to encourage agriculture and to make the French industry independent of foreign fuels. Better results were obtained with this fuel than with paraffin, the machines hauling six furrow ploughs and working to a depth of nearly eight inches, notwithstanding the very hard ground which has not been cultivated for seven years. Owing to a temporary shortage of benzole the percentage of alcohol had to be increased on one or two days to as high as 90, but this did not affect the working of the engine, nor was any difficulty experienced in starting up from cold. The only mechanical change made in the engine was a slight increase in compression, and, of course, the carburetter was adjusted to get the best results with this fuel.

The lesson learned from the trials is that farming operations can be conducted very successfully with native-produced French fuel which under present conditions is cheaper than imported petrol.

In addition to the Rolls-Royce, the Shanghai Horse Bazaar and Motor Co. exhibit a complete line of the Studebaker Sixes, making an exceptionally fine show. The seven-passenger big six shown is a car of 126-inch wheelbase, with 60 horse-power Studebaker demountable-head motor with two-range carburetter, shock absorbers, artistic straight side slanting windshield with ventilator base and integral corner lights, jeweled eight-day clock, tonneau light with extension cord, gypsy head with rectangular plate-glass window in rear, 33 by 4½-in. cord tires; weight 3,125-lbs.

The five-passenger Special Six on exhibition is a car of 119-inch wheelbase; with 50 horse-power Studebaker demountable-head motor, improved carburetter with "hot-spot" intake manifold; cowl lights at corners of windshield; outside and inside door handles; tonneau light with extension cord; 32 by 4-in. cord tires, while the Special Six four-passenger roadster seats four passengers comfortably; individual front seats are separated by an aside and there are four wide doors which eliminate crowding and inconvenience to passengers.

In the same space is shown a Maxwell and a Fiat car.



Inniss & Riddle (China), Limited

STAND No. 5

THIS concern exhibits a line of its many engineering and other specialties of British and American manufacture, foremost among which are two light type 6 and 12 horse-power "Kelvin" marine motors and two 13 and a 26 horse-power heavy type motor from the same makers. A 12 horse-power "Robey" crude oil engine; a "Universal" motor and generator from the Universal Motor Company of Oshkosh, Wis.; "Lodge" spark plugs; Fuller's "Sparta" car batteries; a "Powerlight" set with generator from Dickenson Electric Manufacturing Company driven by a Hamworthy oil engine; Bradbury sewing machines; "B.T.H." (British Thomson Houston) magnetos; gasoline brushes; "Linisher" machine; radial drills, lathes, screw-cutting lathes; hand lever bench shaping machine, etc., for garage use, from Drummond Brothers, Ltd. of Guildford, England; a complete electric plating and polishing outfit from the well-known pioneers and experts in this line, Messrs. Canning & Co., Ltd. of Birmingham, England; Berry's electric grates and "Everite" roofing. A most interesting and instructive exhibit of British products.

KELVIN MOTORS.—The "Kelvin" motor exhibit embraces various machines in sizes from 3 to 60 h.p. This motor is manufactured by the Bergius Launch and Engine Co., Ltd., Glasgow, and 3,000 British fishing vessels, as well as many motor boats used during the war on active service, which were fitted with the "Kelvin" engine testify to the severe and continuous service that can be exacted from this motor. During the war the demand for the "Kelvin" engine was unprecedented and the entire output was required for war purposes. The "Kelvin" engine has been on the China market since 1904.

ELECTRO-PLATING PLANT.—The electro-plating plant from Messrs. Canning & Co., Ltd., Birmingham, is of special interest to the garage trade. Complete plants, from the small gold and silver-plating outfits suitable for the manufacturing jewelery to large installations for garages and factories are carried in stock.

DRUMMOND MACHINE TOOLS.—One of the leading features of Messrs. Inniss and Riddle's stand is the exhibition of Drummond Brothers, Ltd., Guildford, machine tools for garage equipment in which are shown the 3½-in. centre back geared, sliding, boring and screw-cutting lathe. With this lathe it is possible to do all repairs necessary to a motor truck, with the exception of reboring the cylinders and re-turning the crankshaft. To the above lathe may be attached the firm's new indexing, milling and gear-cutting attachment which turns the lathe into an efficient gear-cutting machine.

"EVERITE" ROOFING.—Manufactured by the British Everite and Asbestilite Works, Ltd., Manchester, is well displayed.

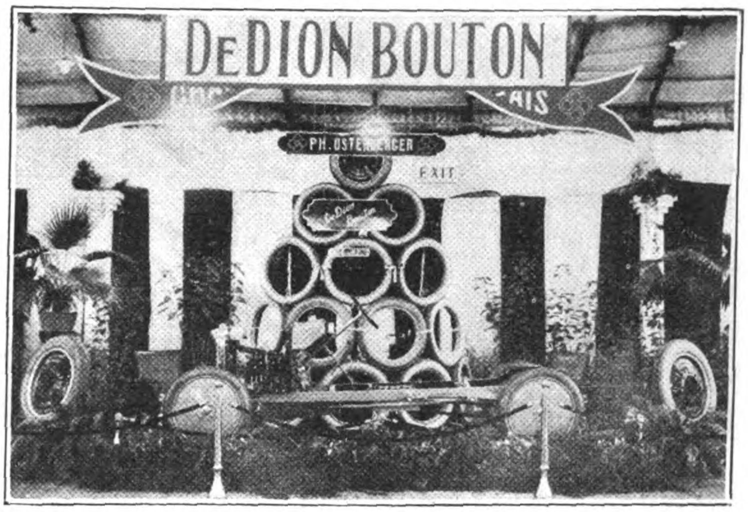
Racine & Company

STAND No. 6

RACINE & Company, one of the oldest French firms established in China, exhibits a complete autogenous acetylene welding outfit manufactured by the Far East Oxygen & Acetylene Company (Société d'Oxygene et d'Acetylene d'Extreme Orient). This company, the pioneer in autogenous welding in the Far East, was created in 1909 in Saigon and the headquarters subsequently removed to Paris. The head offices for the Far East are still at Saigon, where they manufacture principally oxygen by the Claude patented process by liquid air. The business of this firm has since spread over the Orient, where it has achieved first place in this new and important industry. The standard outfit shown by Messrs. Racine & Company is worth study and examination by

engineers and garage owners. In addition to the above, Messrs. Racine & Company also exhibit the Bergougnan tires for autos, trucks and rickshaws, manufactured by the Société Generale des Etablissements Bergougnan, of Clermont-Ferrand, France.

The products of this firm, organized in France in the early days of the automobile industry, earned in France the title of "Kings of the Road" (Rois de la Route). Their endurance is claimed by the manufacturers to be practically unlimited and cases are reported where the chassis has worn out before the tires failed. The speciality of this company is the solid tire for heavy weights. During the war heavy guns were fitted with "Bergougnan" special solid tires and they proved very successful on the Flanders roads, and subject to the heavy wear and tear that use in such severe conditions required.



Grand Garage Francais

STAND Nos. 7, 8, 9

HERE we have a typical French exhibit, in which De Dion-Bouton, Andre Citroen cars and Michelin tires and steel wheels are featured.

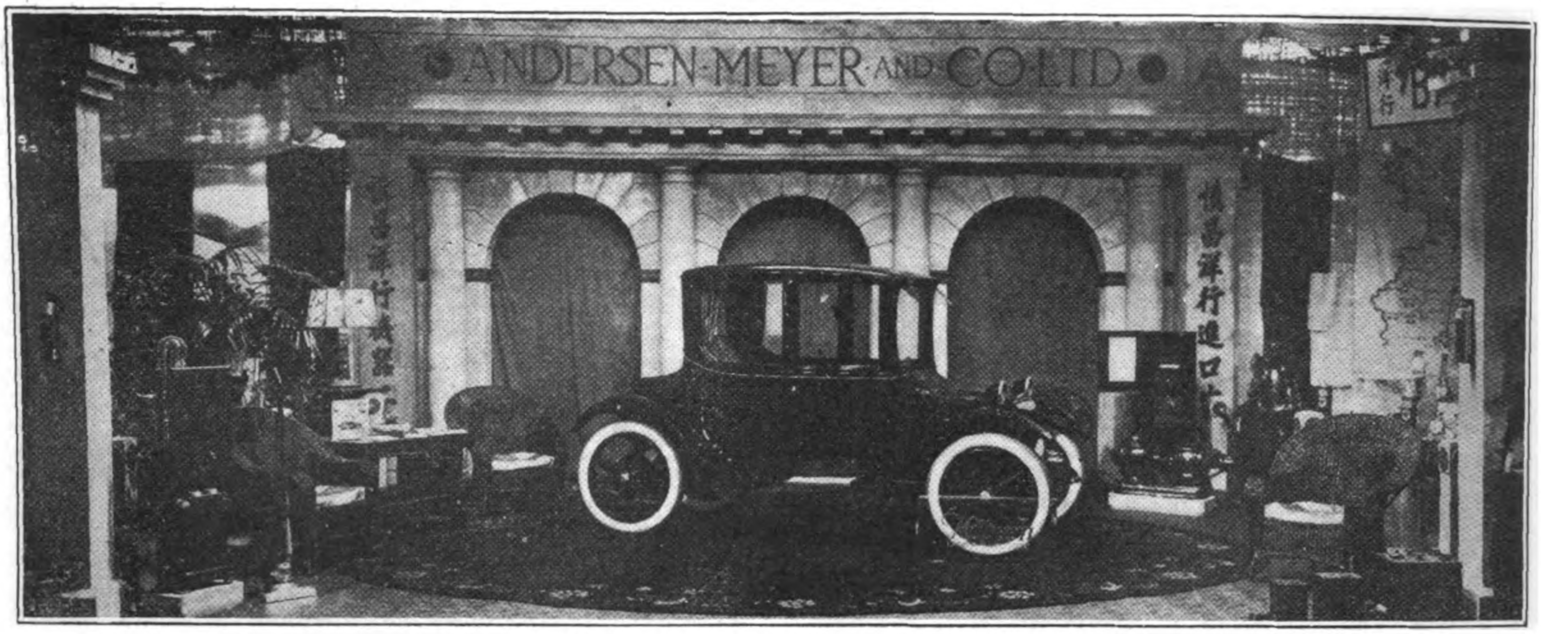
THE CITROEN CARS.—Andre Citroen factory is the best example of mass production in France, and its products are familiar sights on the streets of Shanghai and other Oriental cities. Large scale production and closely figured selling costs make it possible to deliver these cars here at figures lower than any other three speed cars on the market.

The Citroen car has the advantage of small wheels, about twenty-eight by three and a half, disks, carrying smaller tires than the Ford, and thereby offering economy in cost and maintenance. On gas, it makes better than thirty miles to the gallon.

DE DION-BOUTON.—The Grand Garage Francais is also displaying the chassis de Luxe of De Dion-Bouton, characterised by extreme simplicity of construction, featuring full cantilever springs, full floating rear axle, latest improved differential, clutch and motor.

DELAGE.—Also the Delage, the luxurious French car made with front wheel brakes. It comes in either four or six cylinder.

MICHELIN TIRES.—The Grand Garage shows a full assortment of Michelin tires, fabric and cord, straight side and clincher, in sizes ranging from those economical Citroen dimensions to those sufficient to support the heaviest truck and cargo.



Andersen, Meyer & Company, Ltd.

STAND No. 10

MILBURN LIGHT ELECTRIC CAR.—The exhibit of this company is limited solely to the Milburn electric car, one of the most elegant and popular cars in Shanghai, whose straight and level roads are peculiarly adapted for the economical running of this type of safety machine for the family. One charge is sufficient for the longest drive through city and environs. A general electric home 'charging outfit, which can be purchased with the car and attached in the home garage by means of a plug, with the same simplicity as that which connects up the family iron, is also exhibited with the car. It charges while you sleep (no harm car be done by letting the current run on after it is fully charged), and is ready to go at touch of the throttle next morning.

With a Milburn electric, there is no radiator freezing, no locked cylinders, no flooded carburetter, no hesitating motor to coax on a cold morning. The chauffeur can be dispensed with and no nerve-racking driving lessons are necessary. One movement of the starting lever, and you are away, silently, swiftly, safely. It obeys your slighest guidance as if by instinct.

Milburn offers a choice of velours and plushes in variety of designs. The luxurious softness of cushions is never lost, while the exterior represents the highest development in the fine art of body finishing.

An illustration on page 24 shows the pretty car on its way to Woosung, which trip was made in about forty-five minutes. Many electrics bought for the exclusive use of the women of the family have been promptly confiscated by the men of the household and appropriated for use in going and coming from the links.

Andersen, Meyer have a *clientele* which pronounces the Milburn one hundred per cent. satisfactory.

* * *

Barlow & Company

STAND No. 11

EXHIBITING a line of carriage and other lamps made by Wyncott & Son, Birmingham, England.

Good Roads Movement.—In this stand is also the desk of the good roads movement of China, an association created for the purpose of encouraging the building of modern highways throughout this country. The organization does not build roads. Its main purpose is to create a public consciousness favorable to this great reform, against which there has hitherto been opposition for traditional reasons. The education of the people is perhaps the most difficult task in road building, a task that the association has taken upon itself. This movement has as its Honorary Secretary Mr. George E. Sokolsky, of the Shanghai *Journal of Commerce*, assistant director of the government bureau of economic information, and connected with other Chinese commercial bodies. A set of maps drawn by Mr. S. J. Powell, the well-known engineer, adorns the walls of the stall, showing the proposed new roads in various provinces. The movement needs and merits the support of Chinese and foreigners. Its work benefits all.

* * *

The Texas Company

STAND No. 12

THE Texas Company is an ever growing organization which is carrying the red star and green T into all quarters of the globe and to every place where the state of civilization is high enough to require the use of kerosene oil for light, heat and power, and lubricating oils for the lubrication of many and varied kinds of machinery which manufacture other necessities in life.

"TEXACO" implies service and the Company enjoys the reputation of always giving the maximum consideration to its consumer's requirements. This means not only providing goods of the best quality but of placing them on the market in the most up-to-date packings.

Since The Texas Company commenced operation in the fall of 1916, and notwithstanding the many difficulties to be overcome, the Company expanded until now it is one of the leading factors in the distribution of petroleum products in all of the principal towns in China. The merit and high quality of the texaco products have greatly impressed the buying public in this country and to such an extent that texaco sales are only limited by available supply.

To adequately describe the different products marketed by this Company and to mention specific conditions under which they are made, would almost require a separate publication for each product. However, we may volunteer a little information which doubtless will give some idea of the extent and character of Texaco products.

Each texaco product is manufactured for a specific purpose and its fitness for recommended use is fully determined by practical tests before being placed on the market; the crudes are carefully selected and the method of manufacture is scientifically conducted so as to bring out the valuable characteristics of the oil. Consequently, the study and experience given to the thousands of problems involved in the use of petroleum products, is made available through the use of texaco petroleum products.

The number of products marketed by The Texas Company have increased from time to time until practically every petroleum product is now included. The Texas Company's chief products are texaco auto gasolene; texaco kerosene, "Sing" and "Yinfoo"; texaco naphtas prepared for varnish and paint work requiring quick evaporation; texene or texaco spirit, a mineral terpentine, excellent as a mineral thinner for varnish and paint work.

Texaco lubricants are made in different classes for all lubricating requirements; texaco cylinder and valve oils, engine and machine oils, motor oils, marine oils, railroad oils, textile oils for textile machinery. Air compressor oils for high, medium and low-pressure compressors; texaco crater compound for lubricating different classes of gears, wire ropes and chains exposed to excessive heat, dust, salt water and chemicals; texaco lubricating oils specially prepared for electric transformers, hydraulic systems, ink stocks, twine oil, harness oil, tempering oil, cutting oil, etc. Texaco greases are manufactured for all purposes where grease may be used to advantage; transmission lubricant, possessing high lubricating value, will keep the gears of motor cars running smoothly and reduce noise and frictional wear. Home lubricant for use in every home in lubricating sewing machines, phonographs, etc.; refined wax for candle making, etc.; texwax, texaco roofing and texaco asphaltic paint, an excellent paint for iron fences, metal roofing, iron girders, smokestacks and all metal surfaces requiring a durable paint coating.

The Texas Company maintains competent lubricating engineers in every district, whose duty it is to go over plants, investigate all conditions, make recommendations as to the most suitable lubricants to be used and the best method of handling and applying them.

The head office of The Texas Company in China is located at 128 Szechuen Road, Shanghai, with branches at Hongkong, Canton, Amoy, Chinkiang, Wuhu, Hankow, Tsingtao, Tientsin, Dairen, Mukden, Harbin and Chemulpo, Korea.

* * *

"Remember its Waterproof"

A. Arnaud-Coste and R. V. Dent

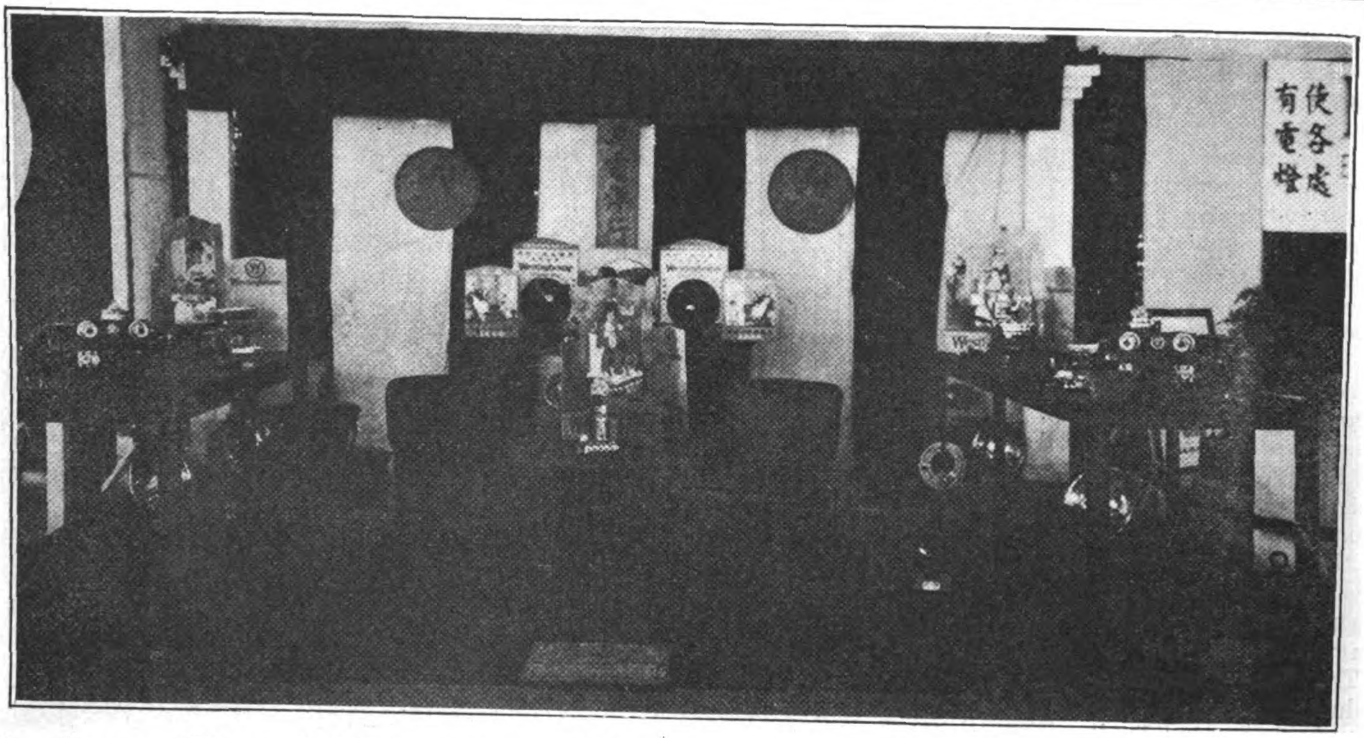
STAND No. 13

THE exhibit of this company is confined to the water-proof and anti-corrosive paint specialties of Toch Brothers, 350 Fifth Ave., New York. It shows Toch Brothers waterproof paint and "Tocholith" anti-corrosive paints for garages, etc.

B. F. Goodrich

STAND No. 14

EXHIBIT of the celebrated Goodrich tires.



Westinghouse Electric International Co.

STAND No. 15

THE exhibit of this great American electrical concern is confined to minor products and accessories in keeping with the demands of the automobile trade and the home. The entrance of this firm into the Chinese field with their own office and representative is of too short a duration to have accomplished any important installations such as are found scattered all over Japan and other parts of Asia, and their activities at the motor show were largely educational in order to familiarize the Chinese with their name and products. The short comprehensive resumé of facts about the Westinghouse plants, products, subsidiaries and factory system, prepared by their local representative and distributed at the show did much to acquaint the Chinese with the Circle "W" chop and what it stood for in service and efficiency.

The names of the Westinghouse industries and their ramifications comes as an eye-opener even to better informed engineers, who will be interested in the following list:—

American Brake Company; The Bryant Electric Co.; Canadian Concrete Products Corporation; Canadian Krantz Electric & Manufacturing Co., Ltd.; Canadian Westinghouse Co., Ltd.; Cutter Co., George; East Pittsburgh & Wilmerding Coal Co.; Fountain Electrical Floor Box Corporation; Interborough Improvement Company; Krantz Manufacturing Company; The Laurentide Mica Co., Ltd., Locomotive Stoker Company; Mansfield Vitreous Enamelling Co; Massey Concrete Products Corporation; Milwaukee Locomotive Manufacturing Company; National Brake & Electric Company; National Steel Foundries; National Utilities Corporation; New England Westinghouse Company; Nuttall Co., R. D.; The Perkins Electric Switch Manufacturing Co.; The Pittsburgh High Voltage Insulator Co.; Pittsburgh Meter Co.; Safety Car Devices Co.; South Philadelphia Co.; Turtle Creek & Allegheny River R. R. Co.; Union Signal Construction Co.; The Union Switch & Signal Co.; United Pump & Power Co.; The Westinghouse Air Brake Co.; Westinghouse Air Brake Home Building Co.; Westinghouse Electric International Co.; Westinghouse Electric & Manufacturing Co.; Westinghouse Electric Products Co.; Westinghouse Friction Draft Gear Co.; Westinghouse Gear & Dynamometer Co.; Westinghouse Inter-Works Railway Co.; Westinghouse Lamp Co.; Westinghouse Pacific Coast Brake Co.; Westinghouse Traction Brake Co.

Amongst the products exhibited having special interest for the garage and automobile trade was a foolproof and fireproof motor starting switch designed expressly for use in garages and other places where there is danger of fire. This switch is hand operated, immersed in oil and totally inclosed. There was also a complete range of Westinghouse lamps; a 1/6 and 1/4 h.p. Type "CD" motors which can be supplied for use on a 32-volt direct current circuit; chafing dishes, curling irons, standard toaster stove; turnover toaster; cosy glow radiators; 3 and 6-lb. electric irons; coffee percolator; nursery milk warmers; warming pads, etc. Mogul light projectors for general interior or exterior flood lighting; 1/8 and 1/4 h.p. type "CA" motors which can be supplied for use on either 110 or 220-volt alternating, single-phase or 50-cycle currents. A motor generator set for charging automobile storage batteries which are made for charging batteries of any kind, type or any number of cells, a necessity for every garage. There was also an automobile engine heater which keeps the engine warm in cold weather while laying in the garage making it easy to start. This saves electric power from the storage battery and gasolene. It uses the same power as an ordinary lamp. The exhibit also displayed single-phase transformers, 9 h.p. type "SK" motors and a rectigon. This apparatus is the latest development for charging an automobile storage battery. The one on exhibition has been in use in Shanghai for over two years.

An interesting and important exhibit was a 1 kw. steam turbo-generator which operates on a steam pressure of from 85 to 125-lbs. per sq. inch and delivers 8 amperes at 125 volts. Several of these sets are in use in China and giving utmost satisfaction. Properly inflated tires reduce wear and tear and costs, and a tire pumping outfit is a necessity in every well-equipped garage. The Westinghouse tire inflator shown at the show commends itself by its simplicity and cheapness.

Fearon, Daniel & Company

STAND No. 16

HERE we find an interesting exhibit of the "Delco" lighting units, manufactured by the Delco Company of Dayton, Ohio. These include a 3,000 watts, 32 v battery plant; another 3,000 watt, 110 v. non-battery plant with a capacity of 150 twenty watt lamps; another 2,500 watt kerosene engine generating set of 160 amper hours, 110 volts, with battery. Storage batteries; Victor portable stereoptican from the Victor Animatograph Company of Davenport, Ia.

Olivier & Company

STAND No. 17

EXHIBITING models of the French "Unic" car and the "Verax Fire Extinguisher," for which they are agents in China. The Unic car is manufactured in several types ranging from the ordinary touring car to commercial trucks. The 13-24 h.p. "Unic" chassis can be fitted with several types of bodies, and the result is a pleasing and attractive car with an engine which fulfils all the requirements exacted of it. The popular styles are seven-seater touring, coupé de luxe, landaulette, six-seater sedan and the four-seater torpedo, all with a 13-24 chassis.

* * *

Societe Franco-Chinoise de Constructions Metalliques et Mechaniques

STAND Nos. 18, 19

EXHIBITING two hydrosliders, of which several are now operating on Chinese rivers.

These hydrosliders are built by the Ste. Ame des Hydro-glisseurs de Lambert at Nanterre (Seine), a well-known French firm, in varying sizes and speeds, the latter covering from fifty-five to ninety kilometres per hour.

One of the boats has been sold to the governor at Canton, where it has proved its reliability and high efficiency. Another is being used for the purpose of carrying on regular trips on the upper Yangtze between the cities of Ichang and Chungking, and it is

further planned to establish regular communication on the shallow rivers in the interior by hydrosliders on a large scale.

Much attention is being paid to these watersliders of immense speed in most of the European countries. During the war they rendered excellent services to the French and British armies, as well as to their expeditionary forces in the colonies. So they were used for fighting purposes and as means of communication in Mesopotamia.

It will give an idea of their efficiency to state that the trip from Bagdad to Bassora on the water which takes at least 12 days was easily completed by them in 24 hours.

Being of a very slight draft, they are especially fit for navigating the typically shallow Chinese rivers, for the transport of passengers and articles of light weight. By their light draft they are not at all affected by strong currents and in rapids, and lose under most trying circumstances neither in speed nor in manageability.

This new type of shallow draft boat comes to solve many of the problems attending the navigation of China's inland streams and rivers. The Societe Franco-Chinoise de Constructions Metalliques et Mechaniques, the new combination which took over the old and well-known machine shops and shipbuilding works of Nicolas Tsu, is pushing the use of these boats in the upper Yangtze regions and news comes of two river navigation companies organized in Szechuan which will employ hydrosliders.

This exhibit, although poorly shown, is one of the most interesting features of the show.

The possibilities offered in China for these boats has brought other French concerns into the field, and we find the Dumont-Galvin hydroslider represented by Chapeaux Freres, 4 and 5 French Bund, Shanghai, an active competitor.

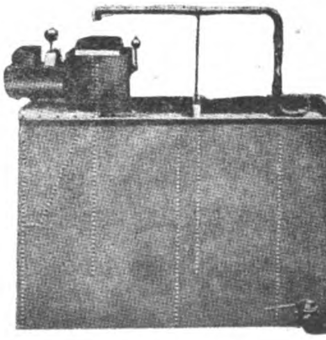
* * *

Babcock & Wilcox, Ltd.

STAND No. 20

THIS company has a model of its well-known water-tube boiler, tube cleaner, ventilator and blower and an automatic water purifier.

This water softener has been designed for the purpose of removing, by chemical means, the scale-forming matter from water prior to its use, thereby preventing damage to boilers, etc., from the accumulation of incrustation, at the same time effecting a large saving in fuel consumption by keeping all parts of the boiler heating surface in a clean and thoroughly efficient condition.

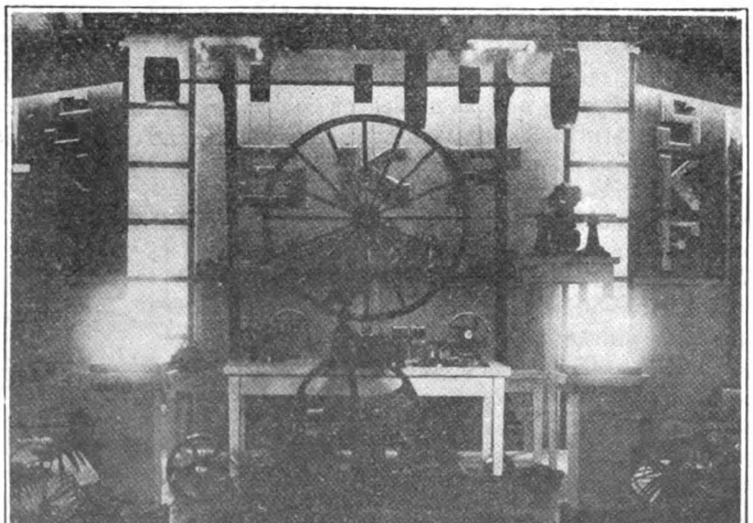


B. & W. Water Softener

It is extremely simple in its working, and the arrangement for mixing the chemical reagents with the water insures most reliable results. The apparatus works quite automatically, the supply of water to the softener being regulated by a float valve, and the chemicals being added by a patent automatic measurer.

If a supply of exhaust steam be available it can be utilized for heating the water, thereby shortening the time of treatment, enabling a smaller apparatus to be used for a given quantity of water softened, and making the plant a combined water softener and feed-water heater. If no steam be available, however, water can be equally treated in the cold.

Over 4,500 of these softeners are now in use all over the world in various industries, such as: Electric light stations; collieries; cotton mills; laundries; railways; mines; silk dyeing works; breweries, etc.



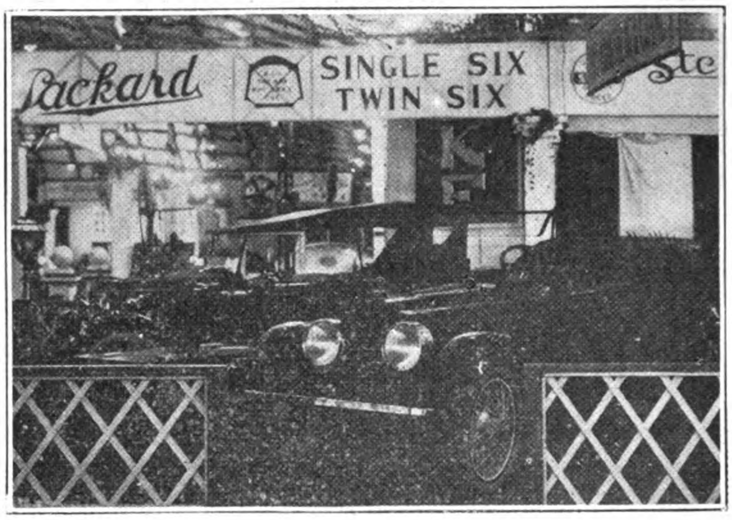
In this country of hard waters, filled with impurities of all kinds which make for scale and other incrustations in boilers which diminishes their efficiency, the B. & W. water softener offers a most practical remedy.

* * *

Chinese S. K. F., Limited

STAND No. 21

THIS is an extremely interesting and well-displayed exhibit of the justly famous patent ball-bearing specialties, manufactured by the Aktiebolaget Svenska Kulagerfabriken, of Gothenburg, in Sweden.



Packard

Exhibited by H. S. Honigsberg & Co., Inc., Agents

STAND No. 22

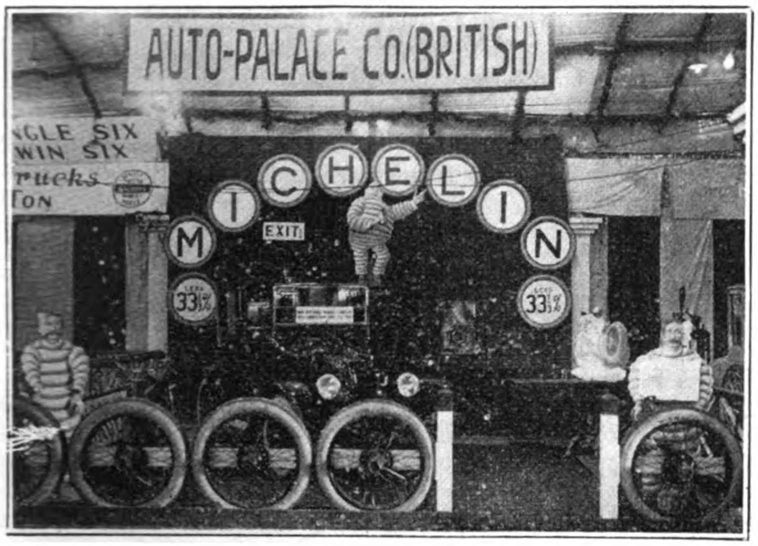
DISPLAYING a model of the single-six, one of the most beautiful of American designs and a twin-six, another classy car. Both of these models are carried in stock by the agents.

Stewart Motor Corporation, Buffalo, N.Y.

H. S. Honigsberg & Co., Inc., Agents

STAND No. 23

SHOWING two models of the Stewart one-ton quality truck. These handy trucks are made in various shapes for special purposes, such as delivery and express, covered, open or stake body, and for coal and contracting hauling with special steel dump body. Only the choicest ash, white wood, and hard pine, heavy gauge sheet steel and forgings and castings of proven quality enter into their construction. Frames are heavily ironed. They have graceful, distinctive lines, and brilliant, rich finish and are built for long service. "An Engineer's Masterpiece."



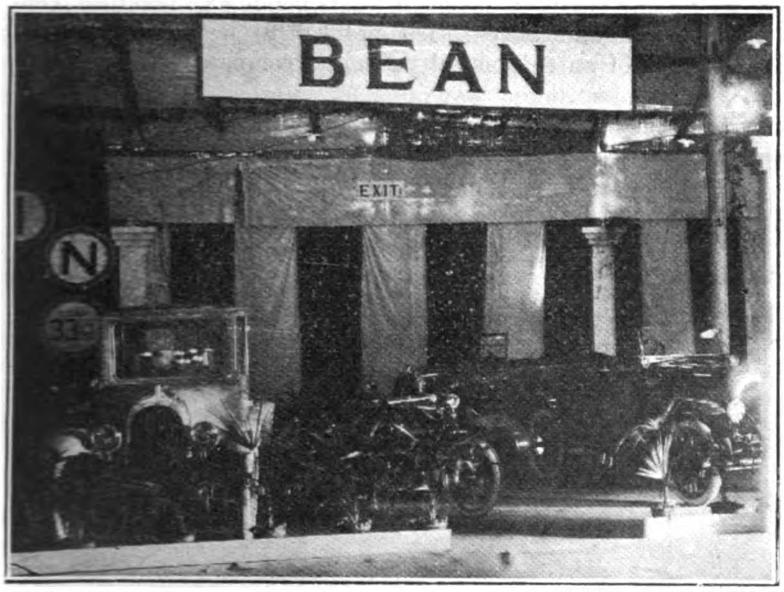
Auto Palace Company

STAND No. 23

FEATURING Michelin tires, Renault cars and Douglas motor cycles.

A magnificent 12-16 h.p. Renault limousine was exhibited by the Auto Palace, a British concern, the oldest garage in Shanghai. Another important exhibit was a Douglas motor car cycle, made by the firm whose motor cycles were used so extensively by the war office in all theatres of operations during the great war.

The Auto Palace also displayed the Oleo plugs, of French make, and a number of special designs of the Michelin tire, particularly of the corded variety which have proved extremely popular for some years past. The garage management of this company act as agents for the Renault cars, and exhibited one of the latest type, complete with electric lighting installation and starter, and h.t. magneto. The consumption of petrol by this car is 15 miles to the gallon. The Auto Palace Company deal chiefly in second-hand rebuilt cars, exhibited at the Auto Palace on Avenue Joffre.



Anglo-Chinese Engineers' Association, Limited

STAND Nos. 24, 25

IN Stand No. 24 this company exhibits three fine "Bean" cars from Harper Sons & Bean, Ltd., and "Triumph" motor cycles with sidecars.

The "Bean" car formerly was known as the "Perry." The present "Bean" is an improved and enlarged model, and it is claimed to be one of the most up-to-date and lowest priced cars of British manufacture for its size.

One of the models is a four-seater touring car with standard body, a two-seater coupé, and a two-seater sports type, whose petrol consumption is 28 miles to the gallon.

Two "Triumph" motor cycles, for which the company are agents, are also shown. Each cycle is the 4 h.p. model with belt drive, and one is a combination with a sidecar.

In Stand No. 25 are many interesting and useful engineering exhibits well worthy of careful investigation of prospective purchasers. Here are seen two generating sets with switch boards, the dynamos being from the Crypto Electric Company of London driven by a Dixon Brothers & Hutchinson, Ltd., Southampton, oil engine ; a 25 h.p. crude oil two-cylinder marine motor, from the Invincible Engine Company of Keighley, England ; a 20 h.p. Dixon Brothers & Hutchinson, Ltd. crude oil marine motor ; a Crypto battery charging set ; garage lathes and machine tools and electric fires.

Beldam Tyre Company

STAND No. 27

THE Beldam Tyre Co. (1920), Ltd., of Brentford, Middlesex, England, are bringing on the China market, through their agents, the North China Produce and Import Co., 39a Canton Road, Shanghai, one of the few all-British tires sold in China.

The exhibit shows the Beldam "Bull Dog" tire, conspicuous by its appearance and finish. The flexibility of the "Vs" along each side of the tread is claimed to lead to long life and to prevent the tendency to skid by wedging themselves between the casing and the road. Beldam "Bull Dog" tires are immune from punctures, their construction being covered by patents. The "Bull Dog" tire is the famous original "Beldam" design, the result of exhaustive experiments made by the late Mr. G. W. Beldam, originator of the tires and founder of the Beldam Tire Co., which started operations in 1909.

Another tire shown is the "Beldam" combination "V" steel-studded tire, constructed to insure absolute immunity from punctures and skidding in any weather and on all road surfaces, the rubber "Vs" counteracting slipping on dry and the imbedded steel studs insuring safety on wet, slippery roads—an ideal combination. A section of this tire is shown by the exhibitors.

The "Beldam" inner tubes which are shown are all of the heavy, red rubber type, specially moulded and strengthened on the parts next to the rim, exposed to the most wear and tear. "Beldam" motor cycle tires, all 4-ply, old favorites with the motor

cycling world at home; are built on the lines of the motor tires, but they have an additional groove to take up circumferential slips. The motor cycle tubes are of the butt-ended type.

Most of the tires shown are clincher types, as owing to the company's heavy government contracts the installation of the machinery for the manufacture of straight sided tires was, unfortunately, delayed. The 32 by 3½ straight tire is on the market, and is exhibited, however, and further sizes will soon be available. "Beldam" casings are built up on the finest Egyptian cotton fabrics; special attention being given to strong walls.

Asiatic Petroleum Company, Ltd.

STAND No. 28

DISPLAYING their various brands of shell oils and spirits, with photos of their Shanghai, Chinkiang and other installations in China.

* * *

Lee & Lee Garage

STAND No. 29

DISPLAYING an Albert and Willys-Knight car and Lee tires.

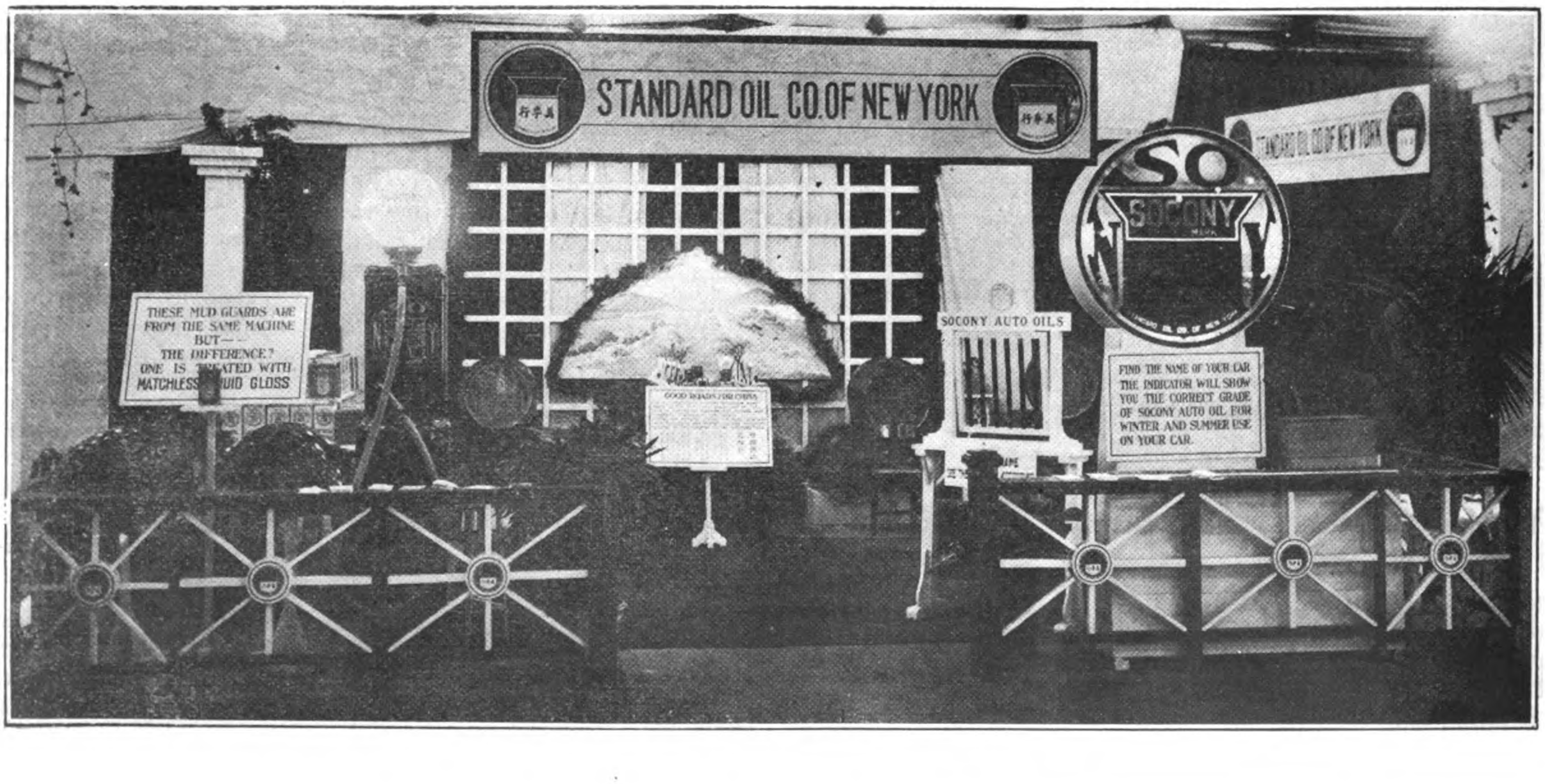
* * *

Standard Oil Company of New York

STAND No. 30

SOCONY products have played no inconsiderable part in the progress of the great automotive industry, the triumphs of which were so splendidly exhibited recently in China's first automobile show. Of timely interest indeed was the model Socony asphaltum road exhibit shown in the Company's booth near one of the main entrances of the exhibition building. The construction of an asphaltum road was clearly shown in miniature to thousands of interested Chinese visitors. By means of a scene in the background the road was made to disappear into the distance, opening up the beauties of a typical bit of Chinese landscape. No Chinese beholder could fail to be affected by the powerful suggestion produced by this picture—of the potential and undeveloped possibilities of a country in which all sections are closely united by a network of good roads and rapid communications, thereby ensuring the close and more sympathetic acquaintance of the citizens of different districts, and fostering the national sympathy and organized force of national opinion indispensable to a country's unity and prosperity.

The subject of good roads in China was investigated and studied by the Socony engineers for many years before any practical constructions were undertaken. The problem to be solved was the construction of an economical pavement composed of asphaltum



and available local materials so blended as to withstand successfully the shock and stress of heavy Oriental traffic. After several years of preliminary investigation, involving a thorough study and analysis of local road building materials available in various districts, four standard forms of road construction were evolved, that are now in common and extremely satisfactory use in the largest treaty ports, namely,

(1) Surface painting
(2) Asphalt macadam
(3) Asphalt concrete (stanocrete)
(4) Sheet asphalt

The first two forms did not differ essentially in method from the standard European and American practice, but the sheet asphalt and asphalt concrete constructions were specially modified and improved compositions of asphalt and local material that would give a compact, resilient, and extremely durable wearing surface under the heaviest forms of Oriental traffic. The stanocrete or asphalt concrete construction being the more generally preferred to the sheet asphalt, as the slightly longer wearing qualities of the sheet asphalt are counterbalanced by the higher cost of construction.

Both the asphalt concrete and sheet asphalt pavements have successfully withstood the shock and stress of heavy traffic in the large treaty ports for from seven to ten years at a practically negligible maintenance cost. Many thousands of square yards of the asphalt concrete pavement have already been laid by the Shanghai, Peking, Tientsin, Hongkong and Hankow municipalities, and in every case the durability of the pavement has supported the original claims for this type of construction.

In addition to road work, asphaltic compositions are extensively used for roofing, water proofing, coating drain pipes, in the construction of tennis courts, sidewalks and as a mastic for breakwater joints and underwater constructions.

The Company maintains a special force of engineers whose services are at all times available to interested parties desiring information or recommendations for the use of asphaltum in conjunction with engineering problems.

* * *

Wah Chang Trading Company

Featuring Nash Motors, Miller Cord Tires and Prest-o-Lite

STAND No. 32

NASH MOTORS.—The Nash cars manufactured by the Nash Motors Company of Kenosha, Wisconsin, U.S.A., are shown in several types, such as the two-passenger, the five-passenger, the seven-passenger, the four-passenger "Spot" model, the four-passenger coupé and the seven-passenger sedan, fitted with the Nash perfected valve-in-head motor, marks a distinct advance in motor engineering. The one ton, and Nash quad types, possess the distinctive degree of perfection which the Nash motors possess. These are also shown by the Wah Chang Corporation, and for the rough use and long, severe service demanded of a motor lorry in China, where roads are in a frightful condition, except inside the Settlement, the Nash truck should prove most satisfactory.

STORAGE BATTERIES.—The Prest-o-Lite storage batteries made at Indianapolis, Ind., are also included in the Wah Chang Trading Corporation's exhibits. Power capacity and long life, are the three great essentials of a storage battery, and the manufacturers claim all these qualities in their battery, which was originated long before the storage battery came into use. Each jar is hand-inspected to an electrical test of 22,000 volts before being passed. Prest-o-Lite batteries have a correct size for every car.

MILLER TIRES are also on exhibition. The manufacturers claim their record of mileage on all tires, and their margins of service place the Miller tire very high in the popular estimation. They are subjected to severe test in the factories and the firm claims that they so average that not one in a hundred is returned for re-adjustment

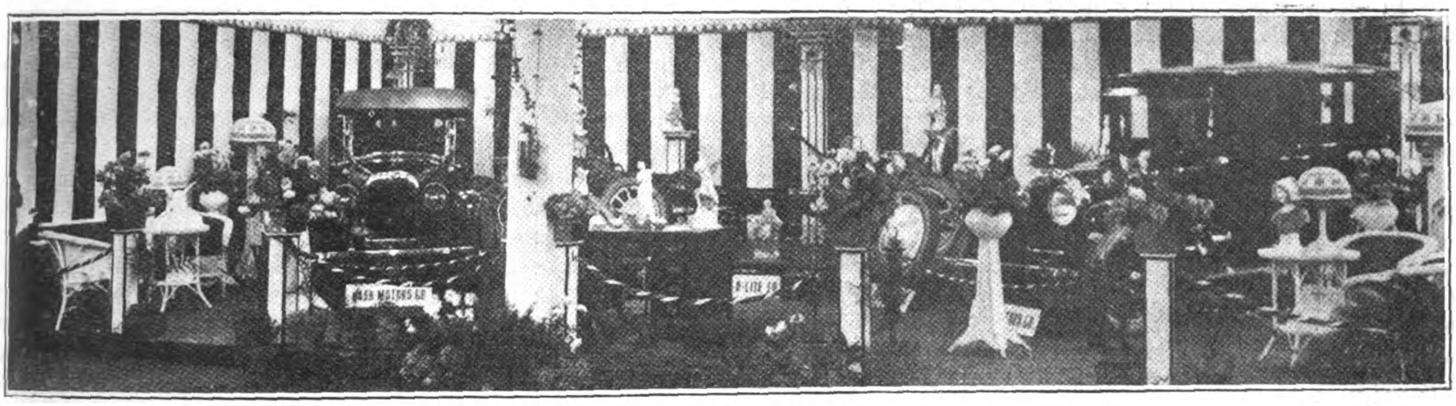


Exhibit of the Wan Chang Trading Company

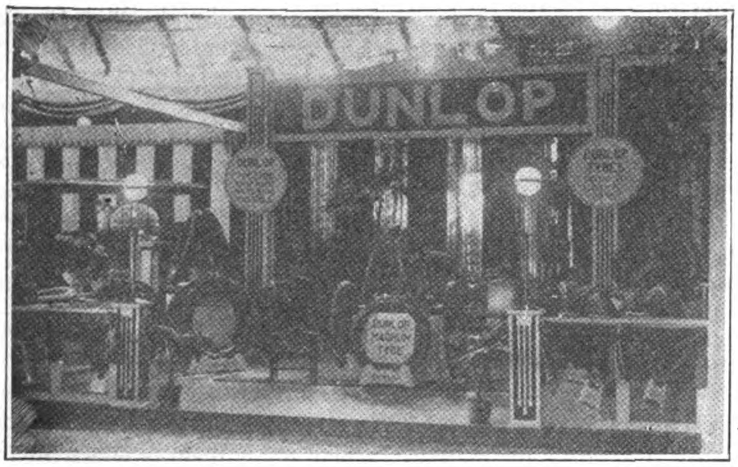
The Dunlop Rubber Co. (Far East), Ltd.

STAND No. 33

THIS stand has a complete line of the well-known Dunlop tires. The Dunlop Company was one of the first to enter the Far Eastern automobile field and has its own factory at Kobe, Japan, which supplies much of the Eastern Asiatic trade. The works and plant at Wakinohama, near Kobe, are one of the best equipped in this part of the world, employing over 1,000 Japanese workmen under direction of foreign experts. The Kobe factory and office are the manufacturing and distributing centres for the Far East. Here they act as contractors and suppliers to the Japanese arsenals for general rubber goods. In addition to tires and other mechanical rubber goods the factory turns out specialities for the chemical and surgical trade and meet with a large and increasing demand not only in Japan but other Far Eastern countries. In tires alone over 300 different varieties or sizes are manufactured at the head works in England, and stocks to the value of over $10,000,000 gold are constantly carried, in order to meet the demand for any special sizes. It is a great enterprise.

The story of Dunlop is the story of motoring. When Mr. J. B. Dunlop in 1888 invented the pneumatic tire, no one foresaw what an astounding revolution the invention would make in the world's locomotion. The invention of the Dunlop tire made motoring possible, and in doing so laid the foundation of one of the world's greatest industries.

The growth of the Dunlop organization, the pioneer company, has been phenomenal, and each succeeding year has brought forth new achievements. The capital of the company has had to be doubled and trebled in the last few years to enable the Company to carry out the big developments necessary to meet the ever-



growing demands for its products. To-day it can be said with justifiable pride that "the sun never sets" on the Dunlop factories, being, as they are, situated in almost every country under the sun.

In China, the Dunlop Company has a complete organization with offices in the principal cities and agents throughout the length and breadth of the country, and without any exaggeration it can be said that the establishment of the company in China in 1909, has, in no small measure, fostered the spirit of progress in transportation which is so essential to the development of the country—this can be seen in the nation-wide demand for better roads at the present-time.

To a large extent the success obtained by the Dunlop Company is due to the inherent quality of its products, it having always been the constant aim and care to place before their customers the very best tires that the most scientific and up-to-date plant in the world could produce. It is not the achievement of a single tire, but the average behavior of the whole output that has won for the Dunlop Company such unrivalled success and popularity which it now enjoys, and with the firm determination not to rest on its laurels but ever constantly to strive after "something better than the last" the company intend to maintain the proud position of being the first tire company in the world, and increase their prestige as time goes on.

The display Dunlop Rubber Company, in addition to the large assortment of tires and accessories, has an interesting assortment of wire wheels, including special wire wheels for the Ford.

Many of the handsome new cars on the floor of the show rest upon the splendid tires manufactured by Dunlop Rubber Company, which have been furnished by the local distributor.

* * *

John I. Thornycroft & Co., Ltd.

STAND Nos. 34, 35

THE exhibit of this company is undoubtedly one of the best that we have seen anywhere and excels in engineering interest all the other stands in the show. Foremost in the eye is one of the new railless electric passenger cars for the Shanghai Tramway Company, with aluminium car body, Thornycroft chassis and wheels, equipped with motors from the English Electric Company and Dunlop tires.

The railless electric petrol freight car was a standard 40 h.p. "J" type four-ton Thornycroft chassis, which had an electric motor placed behind the gear box, for driving either by internal combustion engine or by electric current from an overhead wire. The chassis was jacked up in order to demonstrate to visitors the method of control and running of both systems.

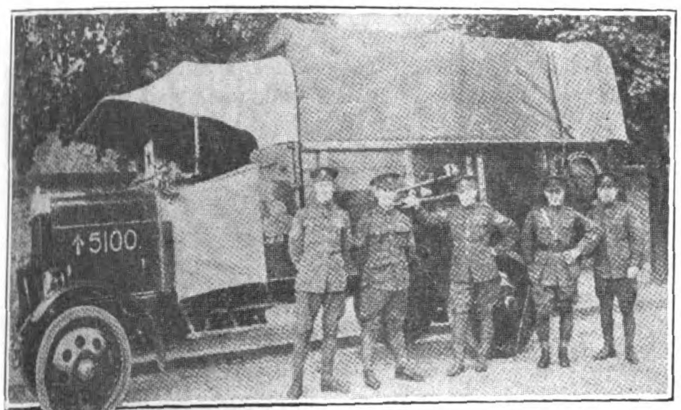
The four-ton, 40 h.p. "J" Thornycroft truck supplied to Messrs. Caldbeck, Macgregor & Co. was the only complete truck in the show and has been in constant use since May 1919 and from all appearances, one would think that this was entirely new.

Two Thornycroft marine motors were exhibited, the 30 h.p. and 50 h.p., each fitted with reducing reversing gear, which Messrs. Thornycroft claim to be the most suitable for propelling fishing boats, tugs, barges and house-boats. Alongside the 30 h.p. the standard outfit comprising shafting, stern tube, propeller and full set of spares showing their massiveness and workmanship.

Models of patrol launches of various types and the railless tram car attracted much attention and interest, also the propellers and large photographs of marine water-tube boilers, twenty of which have recently been supplied to shipbuilders in China.

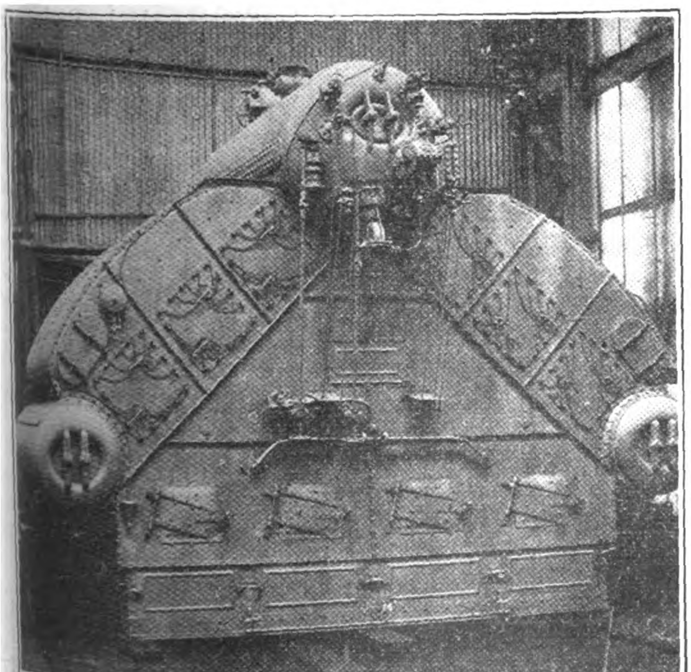
A photograph of Sir John Thornycroft, the founder of the firm, was displayed together with other views of coastal motor boats and flotilla leaders of the British navy, constructed by this firm.

Thornycroft is pushing the sale of their motor trucks in China and the Far East and have already achieved great success. Over 5,000 of these trucks were supplied to the British army in France and made a wonderful record for efficiency. One of the first of these vehicles, dubbed by the soldiers "Old Bill" Thornycroft,



"Old Bill" Thornycroft

arrived in France in November 1914 and was continually employed on the western front up to the armistice. It followed up the advance, was the first British lorry to enter Germany and subsequently won first prize in the Rhine army show at Cologne in August 1919. A truly wonderful record, one that the makers are justly proud of. The Thornycroft motor truck has made many friends and large numbers of demobilized transport officers and men, of which there are a large number in the Far East, are earnest "Rooters" for their old and tried friend of the trenches. The Indian, colonial and foreign markets are absorbing large numbers of these vehicles, and to meet the difficulties of shipment, the chassis and vehicles are sent abroad in pieces packed in the smallest possible space. In India the demand for trucks became so great after the war that a subsidiary company called the Thornycroft (India), Limited was formed and works erected at Calcutta to handle this business and urgent orders from Eastern Asia. To give service to purchasers extensive repair depôts have been established. One of these is



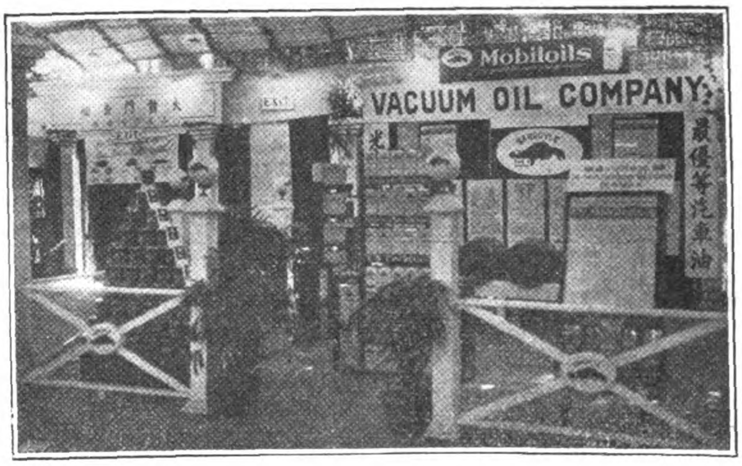
The Thornycroft Water Tube Boiler Supplied to Many Upper Yangtze River Steamers

in Shanghai. The scope of these trucks covers every possible use that can be put to a car. Motor omnibuses, municipal motor vehicles for all kinds of cartage, anti-aricraft mobile gun wagons, double decked buses, lorries, sightseeing cars, etc.

The Thornycroft war record is unsurpassed by any firm in the world. They were one of the first to sense the need of transport and submit vehicles for trial and the first to have a subsidy truck in active service. Their trained engineers helped to build up the great mechanical transport service of Great Britain. From the outbreak of war the government made call after call upon the Thornycroft works for trucks, and the chassis was selected as the one to be fitted with anti-aircraft guns. Special designs of cars were made for the Indian transport service, for Italy, Salonika, Egypt and South Africa. One of the records achieved was a lorry which accompanied the naval expedition which went from the rail head on the Cape-Cairo railway to Lake Tanganyika early in the war.

As in motor trucks, so with their famous launches, which were also used in all parts where British forces were fighting. In Africa and other parts, these boats have been taken through virgen forests to be set up on the inland waterways. Destroyers, coastal motor boats, transport vehicles, ammunition lorries, anti-aircraft mobile guns, depth charge throwers, submarines, salvage tugs, boom defence vessels, R.A.F., seaplane tenders and patrol boats, were turned out in big numbers. The submarine *E33* built by them proved most reliable throughout the war; their big repair department at Southampton fitted out many ships and "doctored" many others: they designed and built a special type of "Q" boat, based on their experience of tunnelled stern river steamers. Thus they rendered great assistance.

For peaceful commercial use they have their river steamers, motor boats, motor lorries and many other products to offer. The reputation they have earned under great stress, will carry them far in China, a formidable competitor to others.



Vacuum Oil Company

STAND Nos. 34, 35

EXHIBITING their various brands of "Gargoyle" oils for all kinds of lubrication. There is little to say about these well-known and widely advertised products, except perhaps to invite attention to the wonderful expansion in their use in China under the able management of Mr. Hallam, who, over a period of years, has built up this business to its present grand proportions.

The Vacuum Oil Company has four plants, two in New Jersey, and two in New York.

The largest of the company's refineries is the one in Paulsboro, New Jersey.

A few years ago the site was a peaceful homestead on the river bank. It now presents quite a different view. Numerous tanks and buildings arise around it. Along what was once a sloping beach, there is now a modern concrete bulkhead more than

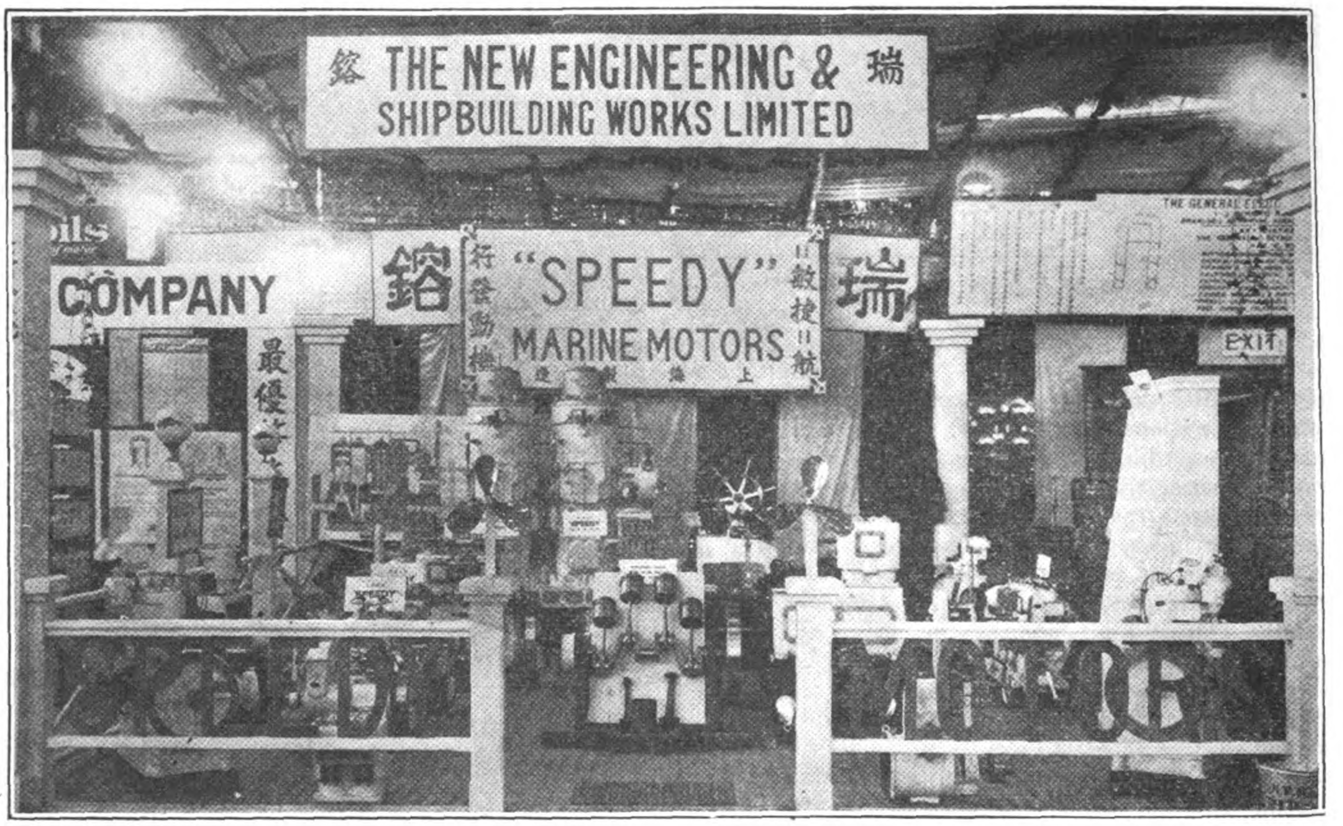
a thousand feet long, with depth of water sufficient to provide berths for the largest tank steamers afloat. There are in the tank farm now one hundred supporting tanks with capacity of over a million barrels. By remarkable engineering feat, a pipe line under the Deleware River connects these tanks with large trunk lines from the Pennsylvania oil fields. Roads have been made through the plant and about three miles of railway trackage laid, to permit of placing cars in various departments to avoid rehandling of material, and thus speed up production.

Vacuum's other three plants turn out millions of barrels of oil every year. The four plants comprise in all an area of territory equal to a good sized county.

This enormous development is cited by the Company as certain proof of the merit of Vacuum products.

boat to travel in the Grand Canal above Tsingkiangpu and the first to penetrate the waters of the Yellow River was the 50-foot Standard Oil Co.'s motor launch *Mei Foo XV* which experienced all sorts of difficulties during the eventful journey. But one foreigner, the assistant marine superintendent of the Standard Oil Co., was on the *Mei Foo XV*. Soldiers stopped the motor launch several times and difficulties were encountered because of low water, although the *Mei Foo XV* draws but 18 inches. At Hanchwang, the lock keeper refused to open the gates to allow the boat to enter Shan Lake after soldiers had stopped the launch. One lock was found open and after three anchors were laid, 100 coolies hove the launch through the lock.

When grass stopped the engines, a sail made from awnings carried the launch along until a junk was obtained as a tow. At



New Engineering & Shipbuilding Works

STAND No. 37

THE greatest surprise of the Shanghai automobile show is in the exhibit of the "Speedy" marine motors manufactured at the shops of the New Engineering & Shipbuilding Works, Ltd., in Shanghai. Here we have a complete display showing a 6, 12, 26 h.p. crude oil marine motors, single and connected to centrifugal pumps and a 3 kw. generator. It comes as a revelation even to old-timers in China to find that such remarkable progress has been made in quantity engine building right here in Shanghai. We have seen some of the excellent motors made at certain British shops in Hongkong and many of the inferior imitations turned out by the Chinese in Canton, but the product of the Shanghai company, outclasses all others made in China. In a market that imports marine motors from all the manufacturing countries of the world, it would seem that the New Engineering and Shipbuilding Works have started a competition that must be felt in the future. Proper advertising and salesmanship should create a demand for these motors, that will bring increasing returns to the makers.

Many of these marine motors are now in active service throughout the inland waters of China installed on some of the finest launches owned by the large trading companies. The first foreign

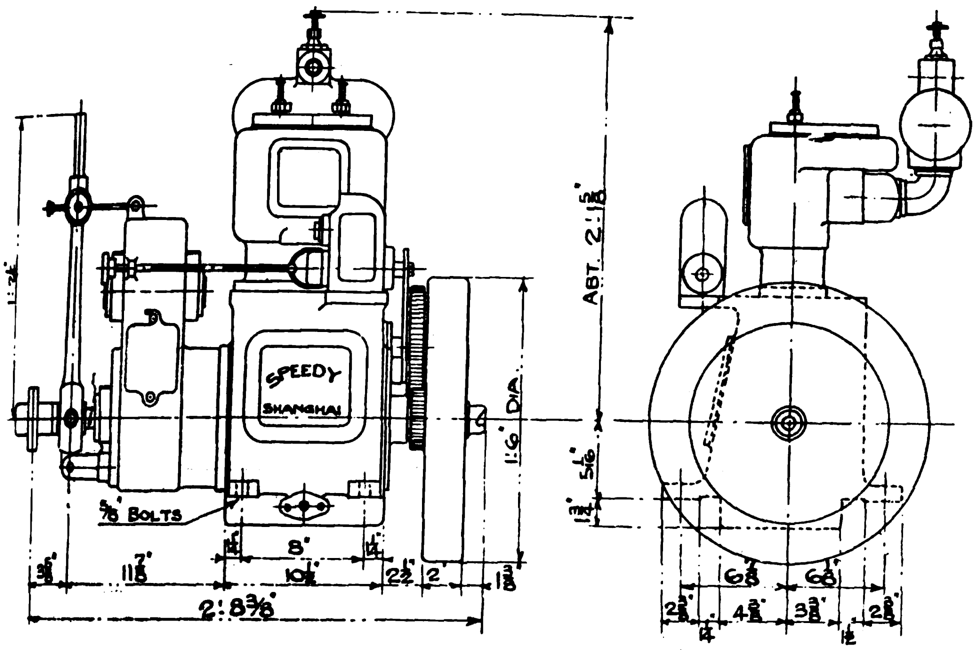
Tsining 100 coolies dragged the boat over a shoal. During the trip in the Grand Canal, and later in the Lu Ho Canal, the ship's company built dams every mile to effect a rise in the water. A native boat was sunk across the canal which reinforced a dam built of mud and kaoliang: the water was thus stopped and rose and the *Mei Foo* was able to proceed. From An Shan to the Yellow River, coolies tracked the launch ten miles in six inches of water which covered mud a foot deep. At times the coolies were up to their waists in mud and water and many were exhausted by the labor. They were taken on board the launch and given treatment. From Tsinan to Shanghai, the launch bucked heavy seas during the trip to the Gulf of Pechili and rounding the Shantung Promontory.

The principal dimensions of the M. L. *Mei Foo XV* are as follows:

Length over all	50-ft.
Beam	11
Draft	2-ft. 6-in.
Gross tonnage	25.1

ENGINES.—Two eighteen h.p. speedy motors.

A short description of these motors will not be out of place for our readers and home manufacturers. The makers say in their circular that "in introducing the speedy motors we are filling a long-felt want in the harbors and inland waterways of China and other countries for a motor of substantial commercial type



DIMENSIONS OF 6 H. P. "SPEEDY" MOTORS

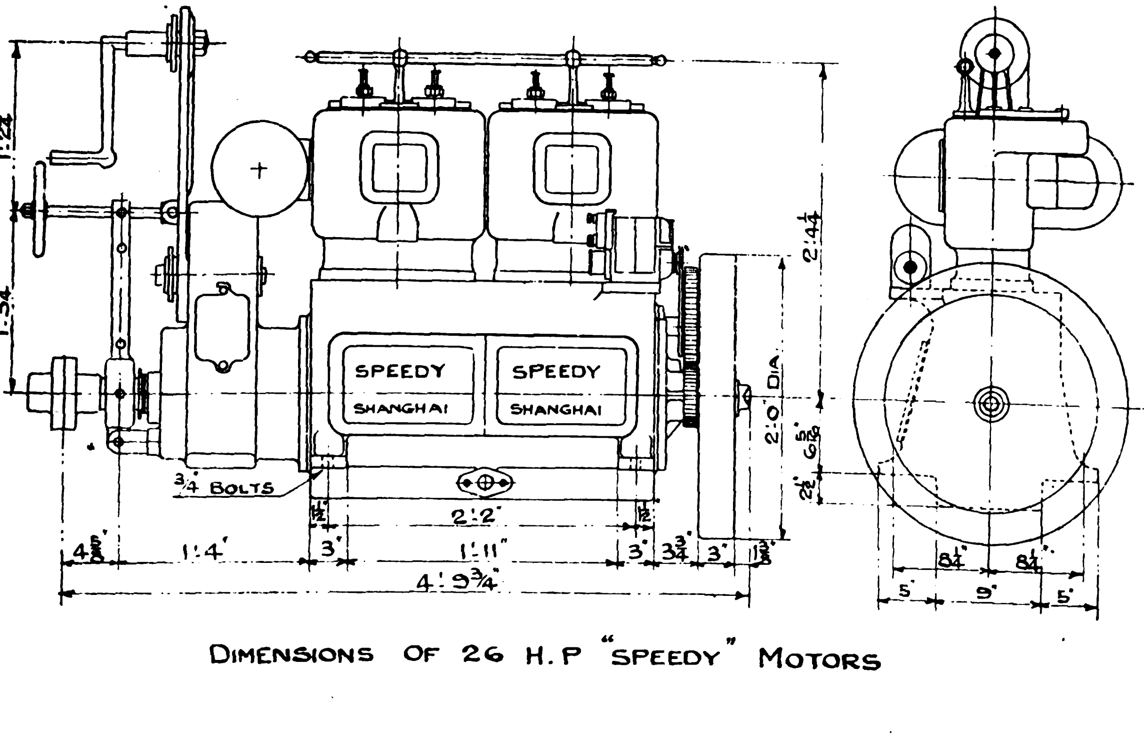
where motors have to be handled by native labor and operated on the cheapest grade of oil. Our belief in moving with the times is to improve in designs and thus endeavor to give our purchasers the latest and best engines obtainable.

"Briefly we place before our clients the outstanding advantages of this motor. The all important feature being the successful running and correct lubrication of moving parts. In China, as is well known, we have to meet the two extreme temperatures and to deal with this, the system of lubrication being splash, we have adopted the following method:—A water jacket is cast on the bottom of the crankcase which is connected directly to the sea or river and through which all the circulating water passes, in doing so it cools off the lubricating oil (which becomes heated through the lubricant coming in contact with the hot piston and cylinder walls), therefore the lubricating qualities of the oil are unimpaired. The crankcases are divided into separate compartments for each two cylinders, each chamber being fitted with ribs in such a way as to cause a continual circulation of lubricating oil. The centre or middle main bearing is fastened into a machined recess in the centre of the crankcase with eccentric washers making it adjustable and all main bearings are lubricated internally by wire ducts. The crankshaft is fitted at both inside ends with ball thrusts which keep the connecting rod bearings and pistons in perfect alignment, thereby enabling the engine to be placed at any reasonable angle.

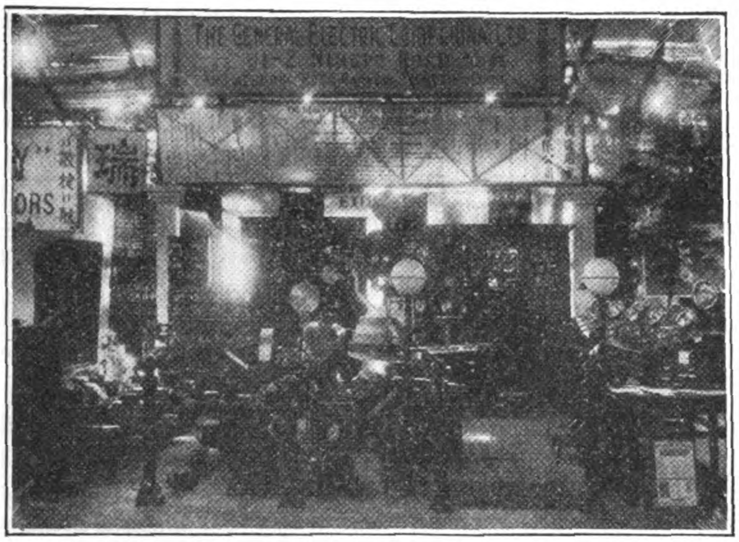
"The circulating water is drawn from the water jacket at the base of the engine by circulating pumps and discharged into a copper pipe common to all cylinders, entering the cylinder at the bottom of the water jacket around which it becomes deflected and is then discharged at the top through a copper pipe into the silencer. With this system it is impossible to have one set of cylinders hot and others cold. Again, the circulating water discharge pipe standing well above the tops of cylinders makes it impossible to create a steam pocket to interfere with the successful circulation of cooling water which might otherwise exist. On each pump telltales are fitted which indicate at a glance if all the pumps are working.

"Speedy engines start direct off the magneto without the aid of coil or accumulators. The reliability of the "Speedy motors" which have made them so successful in the past, is due to the above facts as also that the best of material and workmanship is put into the entire construction, and in their manufacture. It is not our desire to compete with the cheapest makes of marine motors, but to give our purchasers the best value obtainable for full power work without expensive breakdowns and repairs.

"All speedy motors are manufactured in Shanghai thus ensuring the replacement of any requisite spare parts at all times and prospective customers or their interested parties are invited to inspect these engines in course of construction and receive practical demonstration of what these engines are capable of accomplishing. These engines are made in various grades of horse-power ranging from 6 B.H.P. upwards and are particularly adaptable for small and large motor boats, houseboats, ferry launches, tugs, etc. A large number of speedy motors have already been supplied to leading firms and residents in Shanghai and elsewhere in China, where they have given entire satisfaction, amongst whom we may particularly mention the Asiatic Petroleum Co., Ltd., Messrs. Butterfield & Swire and the Standard Oil Co. of New York."



DIMENSIONS OF 26 H. P "SPEEDY" MOTORS



General Electric Co. of China, Ltd.

STAND No. 38

THIS exhibit is also one of general engineering rather than of interest to automobile lovers, although many of the spe cialties are shown for the equipment of garages. Here is seen a Crossley Brothers' gas engine direct connected to a General Electric generator, with General Electric of China panels, motors, ventilators, etc. A Petter generating set; Osram lamps, accessories, Pax saw blades, projectors and belting of all kinds.

* * *

China Mutual Trading Company, Ltd.

STAND No. 39

THIS exhibit is confined to an all-British-made Albert car, with the following specification: 11.9 h.p., four cylinders, 68 by 103 mm. (1,496 c.c.) fully forced lubrication, leather cone clutch, four speeds, separate gear box, straight bevel back axle drive, quarter-elliptic front and canti-lever rear springing, 760 by 90 mm. tires on steel wheels, C.A.V. electric lighting and starting.

This is a car of moderate engine power which must prove adequate and efficient for all practical purposes for which a light car will be used. Interchangeability and standardized accuracy of all parts is an outstanding feature. Particular attention has been given to accessibility of all important parts. The clutch, brake and accelerator pedals are made adjustable for reach and the standard body gives ample room for the comfort of the driver. The four-speed gear box has a three point suspension, and the gear hand brake levers are centrally mounted upon it. The dickey seat is of the "sunken" type, handsomely upholstered, and comfortably accommodates two people. The aluminium body is finished in light grey, with detachable steel and black wings. Nickel fittings harmonize with the bright honnet and polished interior, has a pleasing stream-lined appearance. The Albert all-weather patent convertible body has been designed expressly for the 11.9 chassis and is constructed on the same graceful lines as the other models, completely meeting the needs of those who desire for winter motoring a body draughtproof, snug and watertight, and in summer, one which mitigates the discomfort of dusty roads.

* * *

C. E. Sparke

STAND No. 39

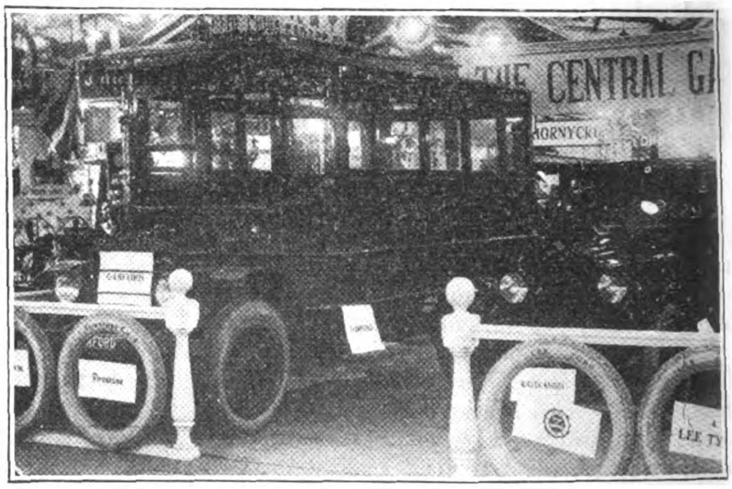
Advertising the Excess Insurance Company

MR. Sparke, as the agent of this company, says that they have settled over 1,000 motor car claims in Shanghai which is proof of the popularity and efficacy of the famous 'XS' policy.

The Central Garage

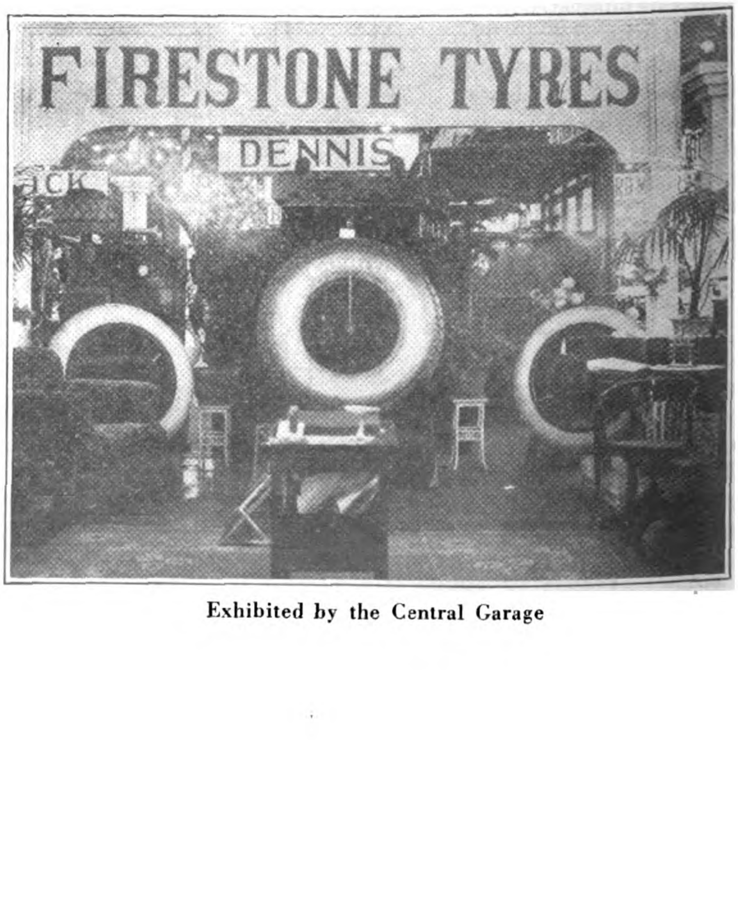
STAND Nos. 40, 41, 42, 43, 47, 48, 49, 50

IN these stands are grouped a wide assortment of British and American cars, truly international in make up. Here are Willys-Knights, Chalmers, Austin, Morris-Oxfords, Sunbeams, Templars, Armstrong-Siddeley, Overlands, Detroit Electric, Morris-Crowley, Wolseley, Angus Sanderson, A. C. Ditton Light Car, Federal, Garford and Dennis Trucks. The feature of this exhibit is a Willys-Knight chassis with exposed working engines, which attracts large crowds, and even to the uninitiated is an education on the working of a motor, not to mention the Chinese who learn for the first time something of how an engine works. The Central Garage is constantly changing its exhibits so as to display as many of their different cars as possible before the show ends.



Garford Truck Exhibit of the Central Garage

The Willys-Knight types shown are the five-seater touring car, five-seater sedan, two-seater roadster and a two-seater coupé. The Overland cars include a sedan, seven-seater touring car, two seater roadster, and a two-seater coupé. The Templar cars are a sedan, coupé and roadster. An exceptionally fine Armstrong-Siddeley, and a Detriot electric car are shown. There is also a Sunbeam, Chalmers, Morris-Oxford, and an Austin car on the floor. In addition to the cars, there is a Smith speedometer and a complete line of S. Smith & Sons, Ltd., British accessories.



Exhibited by the Central Garage

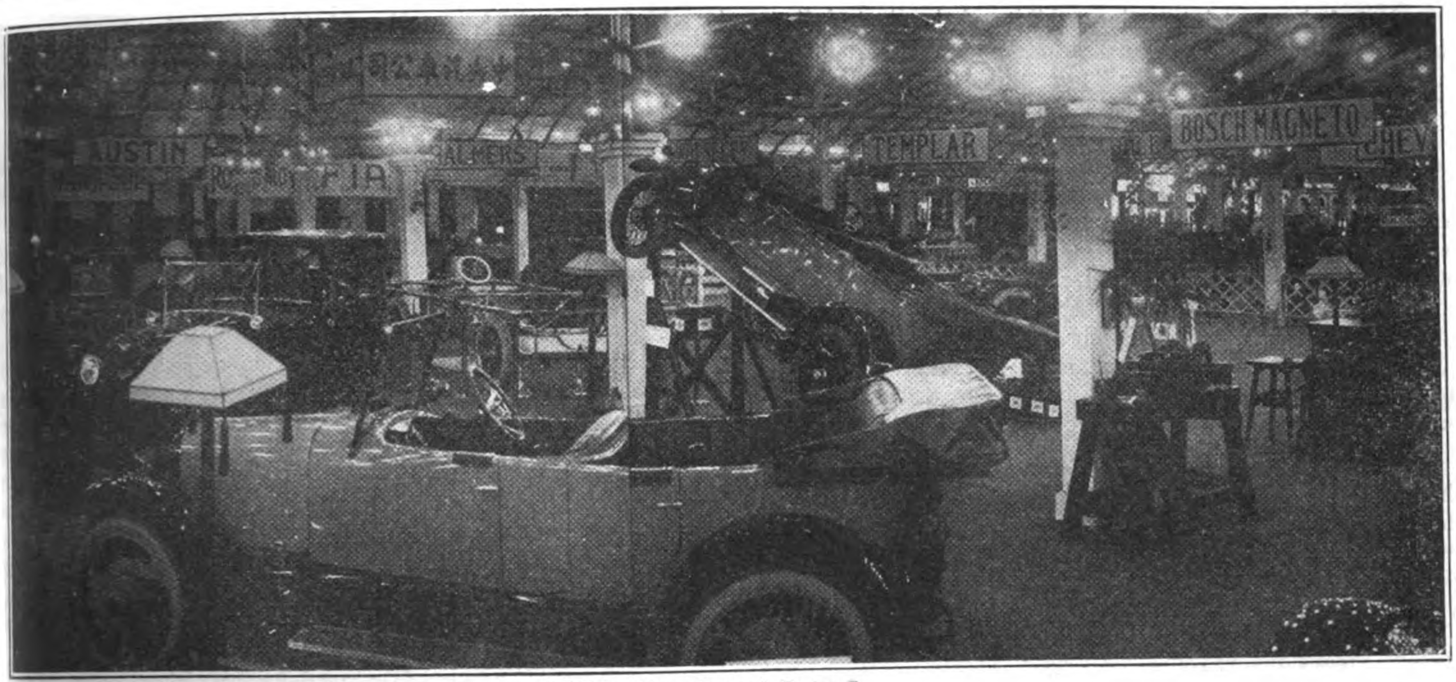
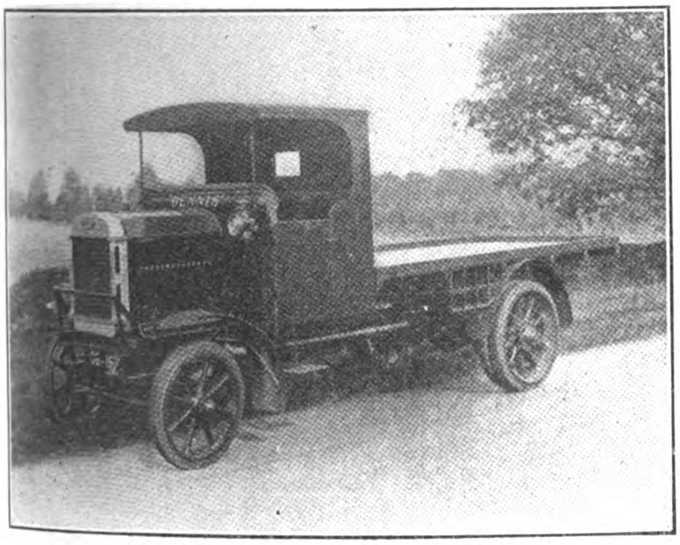
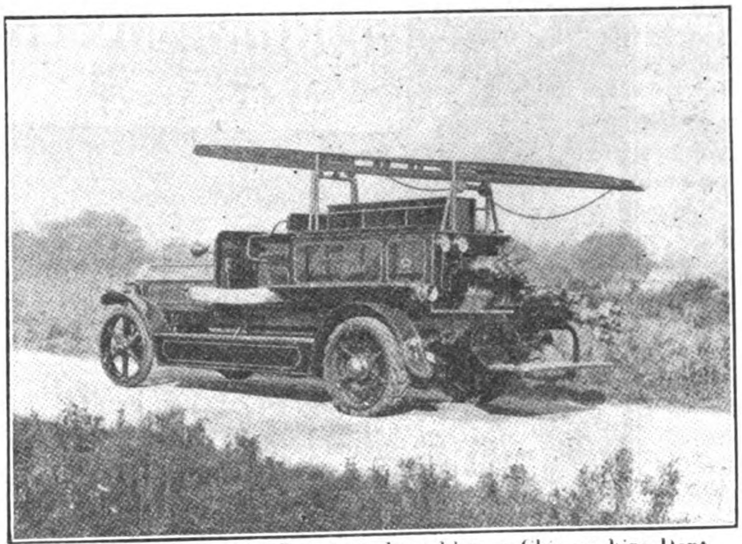


Exhibit of the Central Garage



"War Office Subsidy" Dennis 7½-ton Lorry



The First Motor Fire Engine to be sold to a Chinese Fire Dept. Several now in Operation

Exhibit of the Central Garage

One of the most interesting exhibits of the Central Garage is the famous Dennis 3-4-ton motor lorry, which was put on this market only last year when Sir Raymond Dennis passed through on his tour of investigating Oriental market conditions. Like the Thornycroft Company, the works of Dennis Brothers, Ltd., at Guildford, England, forged ahead during the war and took over their share of the great load in keeping the armies on the various fronts supplied with efficient transportation. A system of mass production was then developed and standardization of parts and models effected, which permitted rapid deliveries to the military authorities, who took over 7,000 of the 3-4-ton model alone. Special types were perfected for different work under varying climatic conditions, those for tropical countries being provided with the new "Colonial" radiator, which, by its greater cooling surface, prevents the water from overheating.

Messrs. Dennis Brothers originated the worm drive and were the first to adopt the turbine pump to motor fire engines of which they are the largest manufacturers in the world, standardizing on two models, 60 and 75 horse-power, with a capacity of 450 and 550 gallons per minute respectively. Large numbers of these machines were supplied to the British government during the war to safeguard important docks, stores and munitions factories. At the great Salonika fire two of these engines established the splendid record of operating continuously for eleven days and nine days respectively without stop. Over 200 Dennis fire engines are in use by the London fire brigade, and are installed in many of the important cities of the East, including Calcutta, Colombo, Singapore, Kuala Lumpur, Ipoh, Penang, Nanking and Tientsin. Several are in use by the Shanghai fire brigade.

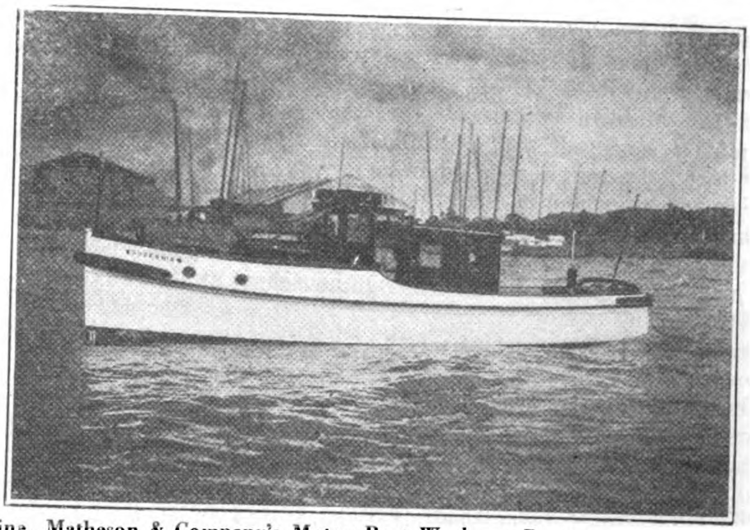
The Dennis agency in Shanghai is held by the Central Garage and with the construction of good roads and municipal improvements the company expect a large and constant demand for their splendid and efficient products. The South China agency of Dennis Brothers is held by Alexander Ross & Co., Ltd, of Hongkong.

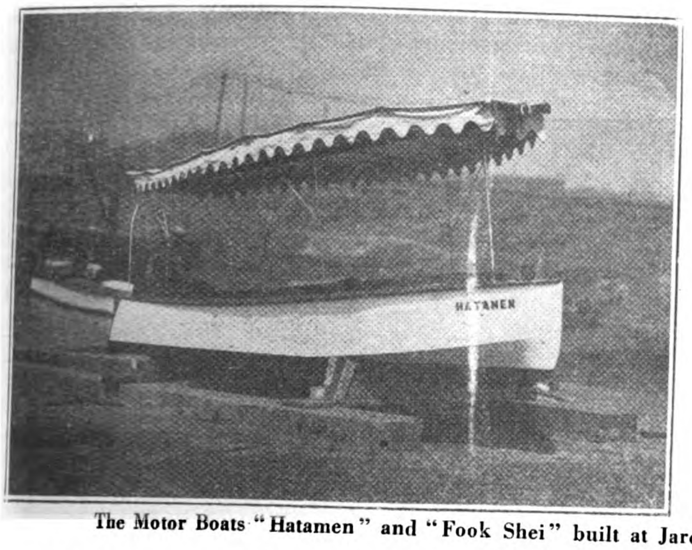
The Central Garage also displays the "Bosch" magneto.

Edgar Allen & Co., Ltd.: "Imperial" Steel Works, Sheffield

STAND No. 45

THE Edgar Allen exhibits at the Shanghai automobile show comprised some of the manufactures of the "Imperial" Steel Works steel department; namely "Stag Brand" special alloy motor car steels for the different parts of motor cars, special steel sheets for motor body work, high-speed tool steels, carbon tool steels, high-speed steel twist drills, reamers, and milling cutters, chisels, files, hammers, etc., all of which are called for and supplied to motor car manufacturers. In addition to the exhibits shown on the Edgar Allen stand, "Stag Brand" high-speed steels, twist drills and milling cutters were to be seen working on the machine tools of the working display of the Associated British Machine Tool Manufacturers. As will be seen from the illustration of the Edgar Allen exhibits "Stag Brand" cast steel files were shown to advantage in the design of a full sized motor car; among other exhibits was a large aeroplane view of the "Imperial" steel works, showing the different departments throughout the works, noticeably the steel foundry department one of the largest steel foundries in Great Britain where steel castings weighing from a few ounces to fifteen tons each are made. The railway and tramway departments wherein Edgar Allen "Imperial" patent rolled manganese steel rails, switches and crossings are made for railways and "Imperial" manganese steel points and crossings for tramways, all types of crushing and grinding machinery for mines, etc., including the manufacture of complete cement plants and colliery plants are the products of the engineering department. In addition to the manufactures of the steel department previously mentioned circular saws for cutting hot and cold steel, wood and slate, etc., also the press department for all types of steel pressings and forgings as called for by Messrs. Edgar Allen & Co.'s branch offices and agencies throughout the world.



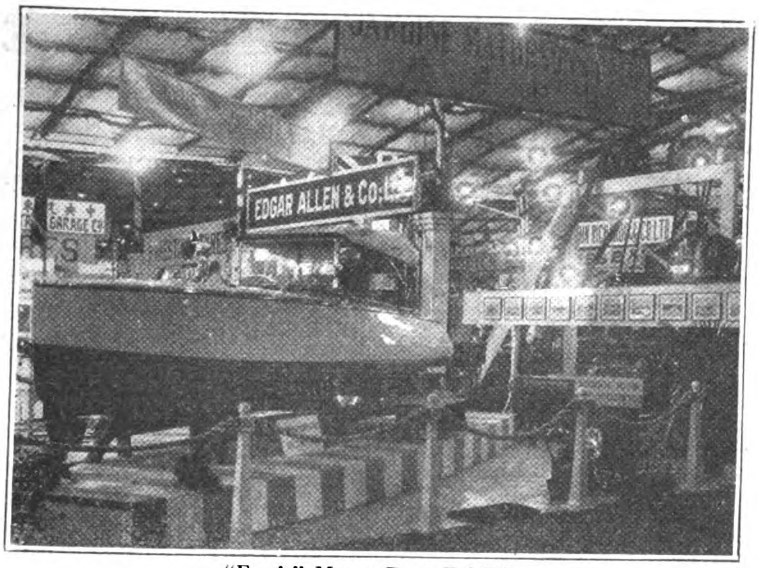


The Motor Boats "Hatamen" and "Fook Shei" built at Jardine, Matheson & Company's Motor Boat Works at Pootung

Jardine, Matheson & Company, Limited, Marine Motor Department

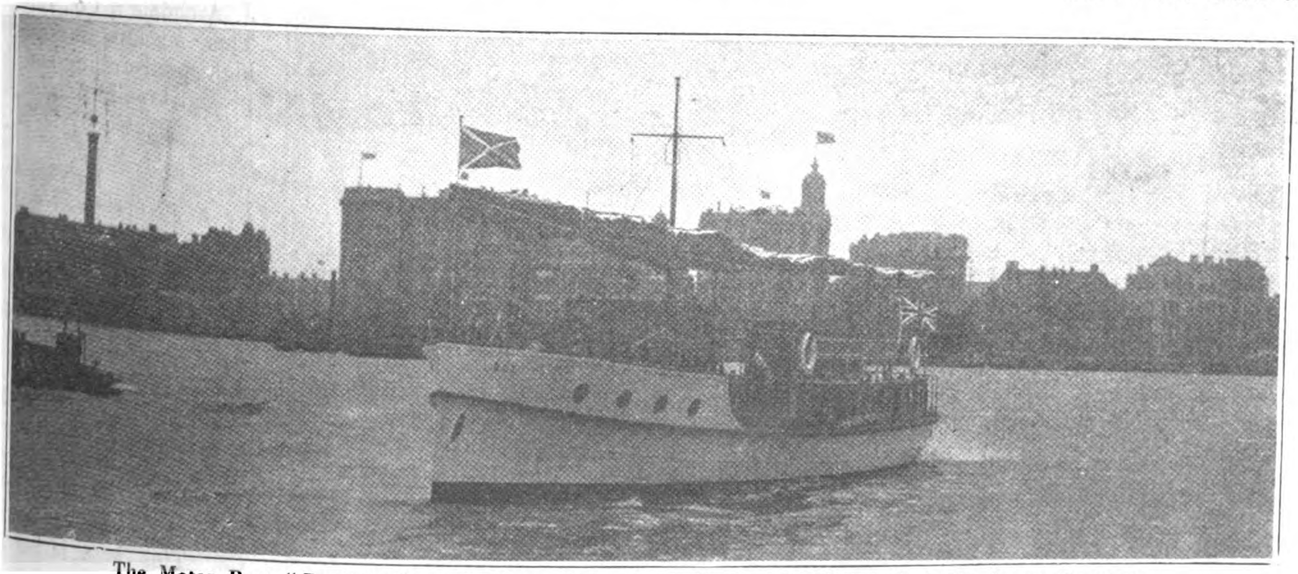
STAND No. 46

ONE of the features of the show: exhibiting a 20-foot four-seater motor boat runabout made in cedar wood and finished in white enamel with nickel-plated fittings operated by a Model "R" 50 horse-power, four-cylinder Stirling motor, guaranteed to make 20 knots or over. In addition, there is a 40-50 four-cylinder "Gleniffer" kerosene marine motor, which operates at 600-700 r.p.m. made by the well-known British motor specialists, the Gleniffer Motors, Limited of Glasgow. The model shown is a beauty, a remarkable example of finish and elegance, a high tribute to the makers. There is also a 9-12 horse-power four-cylinder "Universal" kerosene motor, from the Universal Motor Company of Oshkosh, Wis., which operates at 1,200-1,700 r.p.m. There is also a 20-30 horse-power four-cylinder "Frisbie" kerosene marine motor operating at a speed of 600-800 r.p.m. manufactured by the Frisbie Motor Company of Middletown, Ct. On the pond in the gardens is a 16-foot teakwood tender fitted with a 9-13 horse-power "Universal" motor, which has a draft of only 7 inches and a speed of 8 miles an hour consuming one gallon of kerosene per hour.



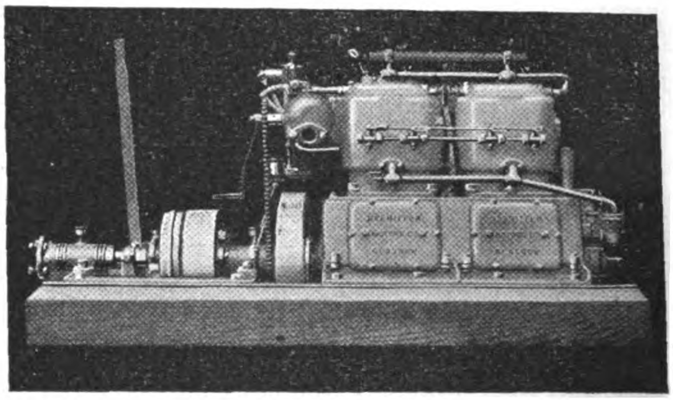
"Ewo's" Motor Boat Exhibit

Messrs. Jardine, Matheson & Company have long specialized on marine motors and motor boats, being one of the first concerns with the vision to look ahead and provide for this rapidly expanding method of transportation on China's inland rivers and lakes. Probably the most comprehensive stock of marine motors in the East is to be found in the marine motor works of Jardine, Matheson & Company, Ltd., at Pootung where motor boats of all sizes and description are constructed and overhauled. The motor yacht *Bee* herein illustrated is a splendid example of the excellent work turned out from this estab-



The Motor Boat "Bee" built at Jardine, Matheson & Company's Motor Boat Works at Pootung

lishment. The *Bee* is a steel twin-screw vessel of unusually graceful lines and beautifully fitted accommodations with a cruising speed of eleven knots. To travel by boat in any of the beautiful waterways of the Yangtze Valley shallow draft is essential and our illustration of the *Hataman*, a 16-foot light draft tender, shows a launch with a speed of about eight miles per hour on a draft of only seven inches. The engine in this interesting little craft is a 9-12 horse-power "Universal" kerosene motor with a fuel consumption of less then one gallon per hour. This launch tows an ordinary foreign houseboat at about five miles per hour and makes an ideal tender. The *Fook Shei*, also illustrated, is another product of the "Ewo" works. She is a husky towing tender with a speed of nine miles per hour. The fast runabout exhibited on Jardine's stand, was a splendid example of first-class workmanship from the Pootung motor works and the three motors represented three distinct duties: the little 9-12 h.p. four-cylinder "Universal" for small light draft vessels, the 20-30 h.p. valve-in-the-head "Frisbie" for general utility and medium-sized craft and the 40-50 "Gleniffer" for continuous hard service in heavy duty boats. The Gleniffer, it may be mentioned, is one of the best known British marine motors with a magnificent war-service. They operate with paraffin, petrol, alcohol or naptha, and for heavy work have few equals. With China's labyrinth of waterways it is certain in that given settled conditions, the future will see considerable development in the marine motor industry and the marine motor department of Jardine, Matheson & Company with its experienced foreign staff will certainly figure largely in this development.



Gleniffer Marine Motor Exhibited by "Ewo"

Jardine, Matheson & Company, Machine Tool Display

STAND No. 53

IN addition to the exhibit of Edgar Allen & Co. and the fine show of their marine motor department, "Ewo" had also an extensive display of machine tools. Jardine, Matheson & Company are the sole agents in China for the Associated British Machine Tool Makers, Ltd., which comprises the following firms: J. Archdale & Co., Ltd., Birmingham, W. Asquith, Ltd., Halifax, J. Butler & Co., Halifax, Churchill Machine Tool Co., Manchester, Kendall & Gent, Ltd., Manchester, J. Lang & Sons, Ltd., Johnstone, J. Parkinson & Son, Shipley, G. Richards & Co., Ltd., Broadheath, Smith & Coventry, Ltd., Manchester, H. W. Ward and Co., Ltd., Birmingham.

There are seven machines actually working at the show and they reveal the best features of British workmanship.

No 1. "Universal" milling machine by Messrs. J. Parkinson & Son, Shipley. This type of machine will do accurate work, gives maximum output and is very easily handled, a special patented feature being the method of driving the feed independently of the spindle by which the capacity of removing metal is greatly increased. The main drive is by four-step cone and one rate of gears, thus providing eight speeds for each speed of the counter shaft, which is of compact gear-box type with two forward and one reverse speed.

No. 2. Patent sensitive and radial drilling machine by Messrs. J. Archdale & Co., Birmingham. This machine is designed for high-speed drilling and has improved tapping motion for tapping, operated by lever on the saddle, as well as other improvements. Driving motion is by a change-speed box of the sliding wheel type giving nine spindle speeds, but it can be driven by electric motor instead of the constant speed belt. The radial arm gives a radius of 32 inches, which can be extended to 38 inches and the drilling test in M. S. 3/4-in. diameter rate of drilling is 6-in. per minute.

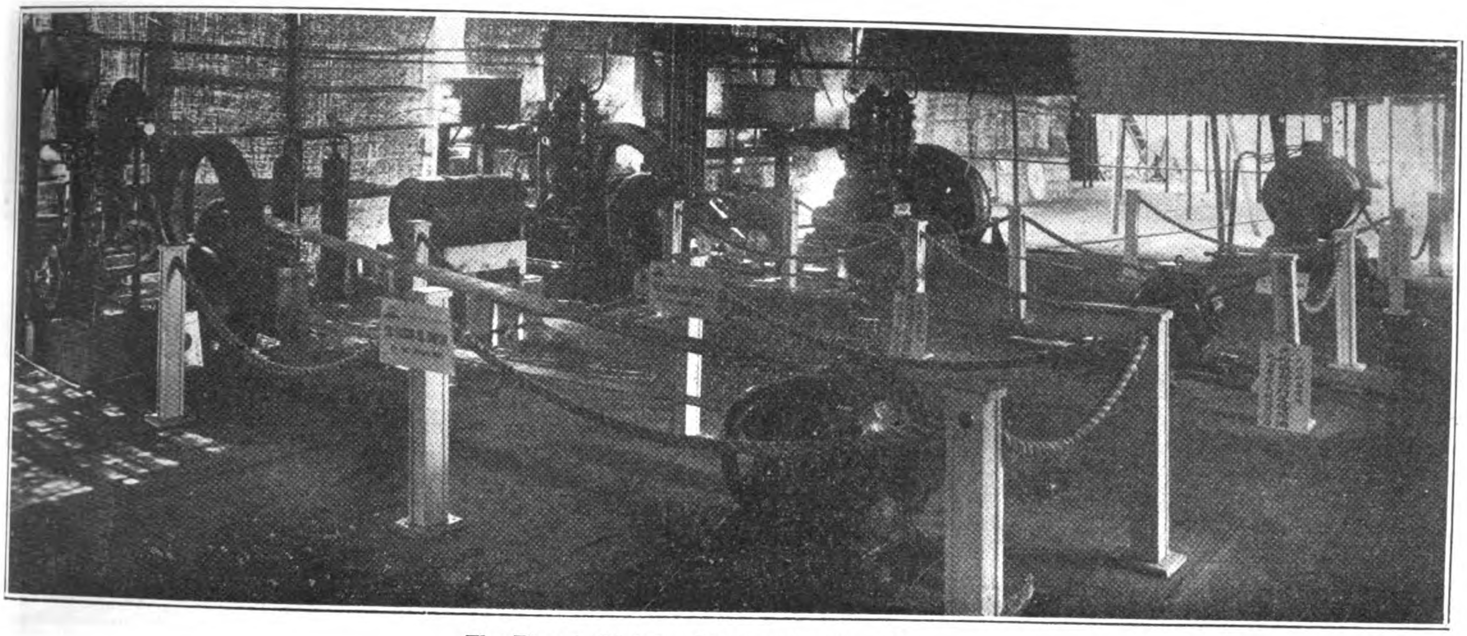
No. 3. Radial drilling machine by Messrs. J. Archdale & Co. This is a larger machine

capable of doing larger work with a radius of 3 feet. Nine changes, and with double gearing 18 changes, of speed are provided, and in the drilling test in M. S. 1-in. diameter the rate of drilling is 6.2-in.

No. 4. 16/18-ft. stroke croak type shaping machine by Messrs. J. Butler & Co., Victoria Iron Works, Halifax. This is one of the four sizes in which these machines are manufactured.

engines and dynamos were taken direct from the cases in which they arrived, set up on their foundations and run up to load without preliminary trial runs and continued in steady operation during the entire show without developing trouble of any kind.

The plant comprised three sets, consisting of crude oil engines of 70 h.p., 25 h.p., and 18 h.p., the generators being of 45 kw., 15 kw. and 10 kw. respectively. The engines are manufactured by



The Electric Lighting Plant at the Auto Show

No. 5. 6-ft. by 30-in. by 30-in. high-speed planing machine by Messrs. Butler & Co. The gearing is unique in this machine. All the gears are arranged on specially prepared flanges inside the bed and no shaft bearings are cast with the bed. Once the bed is fixed on its foundation it need never be disturbed.

No. 6. 10-in. by 24-in. "Universal" grinding machine with tool and cutter equipment, by Messrs. Churchill Machine Tool Co., Manchester. In addition to the tool and cutter grinding equipment, the machine is a useful adjunct to the grinding equipment of any shop, as, if employed on plain cylindrical grinding of shafts, etc., it is just as rapid in operation as the standard "Universal" or small plain grinding machine, the table, mechanism, and speeds of these machines being identical. This latter is an important point, because when the machine is not employed for cutter or tool grinding it can always be employed for grinding shafts and similar work.

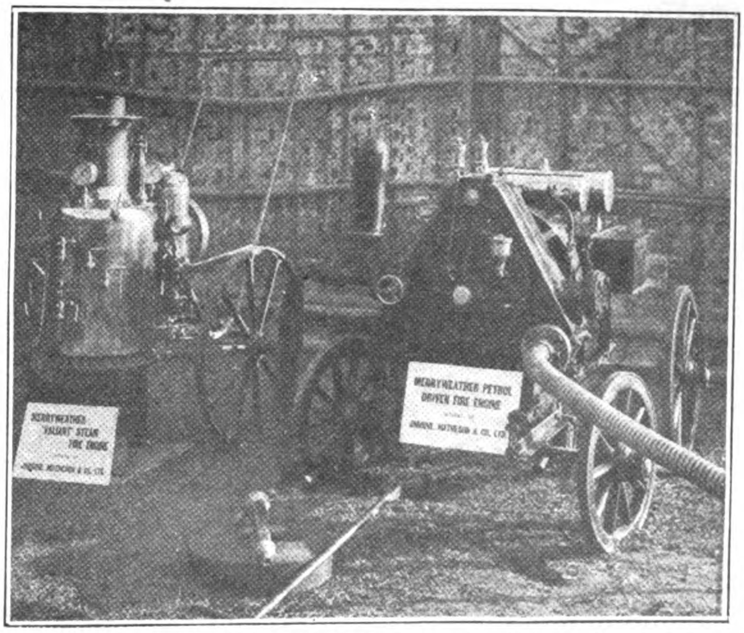
No. 7. 69X single wheel wet tool grinder by Messrs. B. R. Rowland & Co., Ltd., Reddish, near Manchester. This is manufactured in three sizes covering a long range of work, and in each case, reliability, appearance and freedom from splashing or other trouble have been studied.

Fire Protection.—Hooked up ready to protect the highly inflammable structure against fire, were a Merryweather petrol driven and a "Valiant" steam fire engine from the well-known British manufacturers, who have been represented for many years in China by Messrs. Jardine, Matheson & Co.

Electric Lighting Plant

The illumination for the automobile show was supplied by the electrical department of Jardine, Matheson & Company, Ltd., from engines and plant of the different sizes carried in stock. The

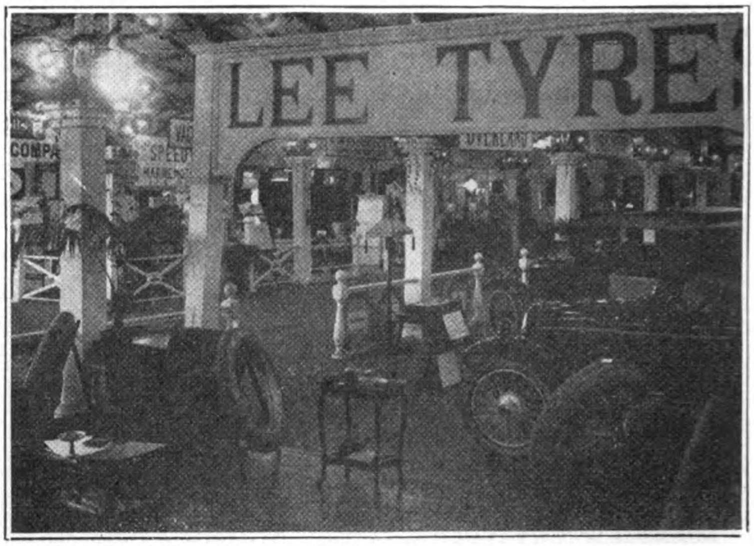
Messrs. Vickers Petters of Yeovil, England, and the generators by the English Electric Co., Ltd. These engines are extremely economical in fuel consumption ranging between .45 to .55 pints of fuel oil per B.H.P. hour. The governor gear is very simple and efficient



Merryweather Fire Engines Ready to Protect the Buildings against Fire

in operation and can be readily adjusted. The engines are started by means of compressed air starters, the tanks which store the air being charged direct from the engines. The fuel oil for these engines was supplied by the Asiatic Petroleum Company, Ltd.

Fuel Oil Tank Supplied by Asiatic Petroleum Company for the Electric Light Plant

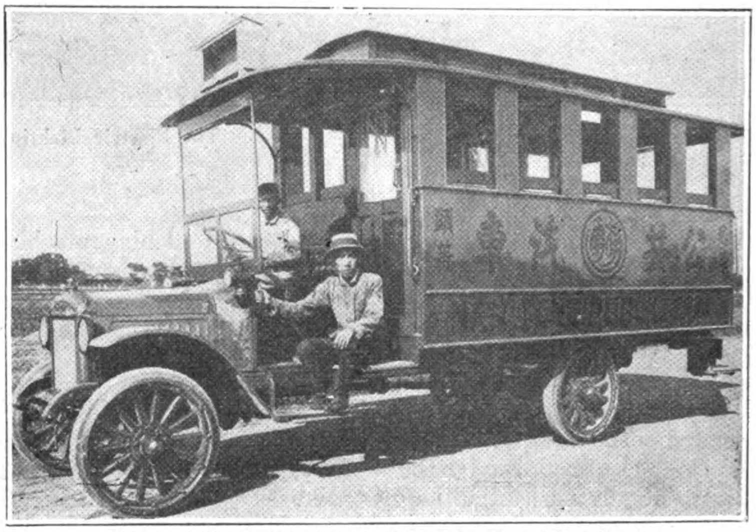


Stand of the Lee Tire and Rubber Company, exhibited by their agents, the Central Garage

John Richards & Company, Ltd.

STAND No. 51

THE old and well-known Shanghai Electric and Asbestos Company, Ltd., one of the pioneers in the Chinese electrical field, went into voluntary liquidation some time ago, but many of the foremost local British interests came together to extend support and encouragement to the two directors who had contributed so much towards the opening of this market for British materials, and out of the ashes of the old concern, arose the new hong, John Richards & Company, Ltd., with Mr. Richards as managing director and Mr. J. Frost as director. With larger capital and a wider field the new organization has rapidly come to the front again as one of the strongest electrical and engineering firms in the China field, securing contracts that leave no doubt as to its ability to win success. The electrical exhibit of this concern at the auto show covered a wide range of British and some American specialties, all brilliantly illuminated by large clusters of Philips lamps, manufactured by the Philips Glowlamp Works, Ltd. There were also shown Ferranti motors of all sizes and for all purposes, switch gear from Ferguson, Pailing & Co. of Manchester, Hart accumulators, with a Thornycroft-Vickers generating set, such as have been installed in several of the Hongkong & Shanghai Bank buildings in China, Craigpark cables and wires, national gas engines made at Ashton-under-Lyne, H. T. Boothroyd, Ltd., dynamos and motors and a lift, from the Titan Lift Company, Ltd. of London, of which several have been recently installed in Shanghai. The American agencies of this concern were represented by a line of motors and fans from the Century Electric Company of St. Louis. On the whole a most excellent and comprehensive exhibit, which, taken with the activity and record of the new concern in obtaining business is evidence that the reputation of the old phœnix bird we used to read about is being pushed hard by its modern electrical and asbestos lined prototype.



Garford Motor Bus for Nantungchow furnished by the Central Garage, Shanghai

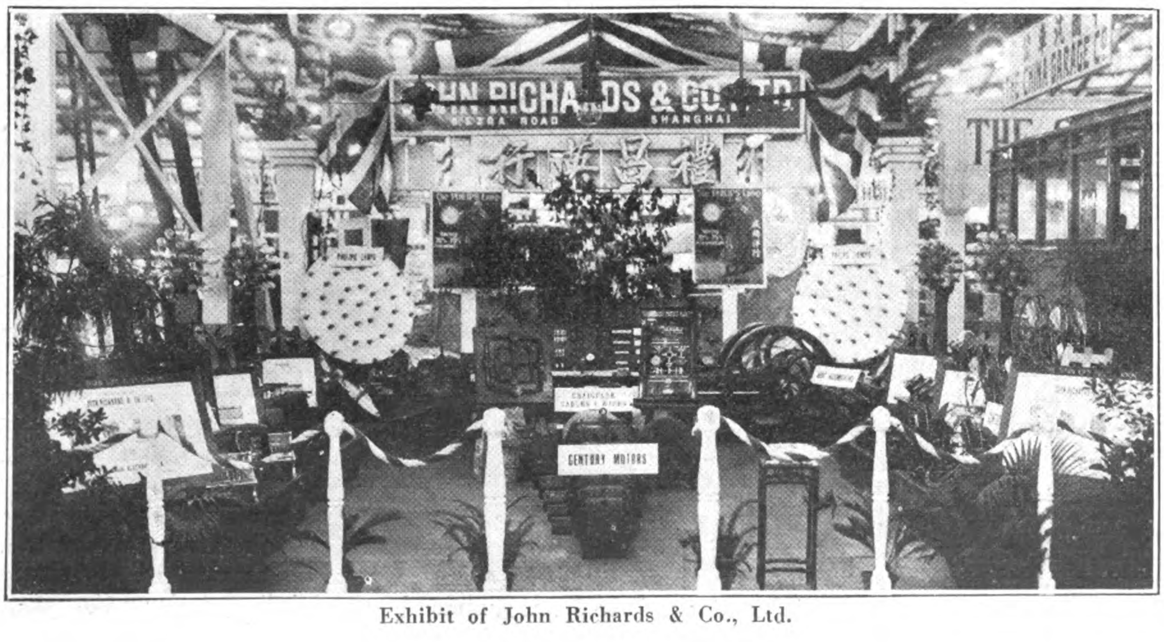
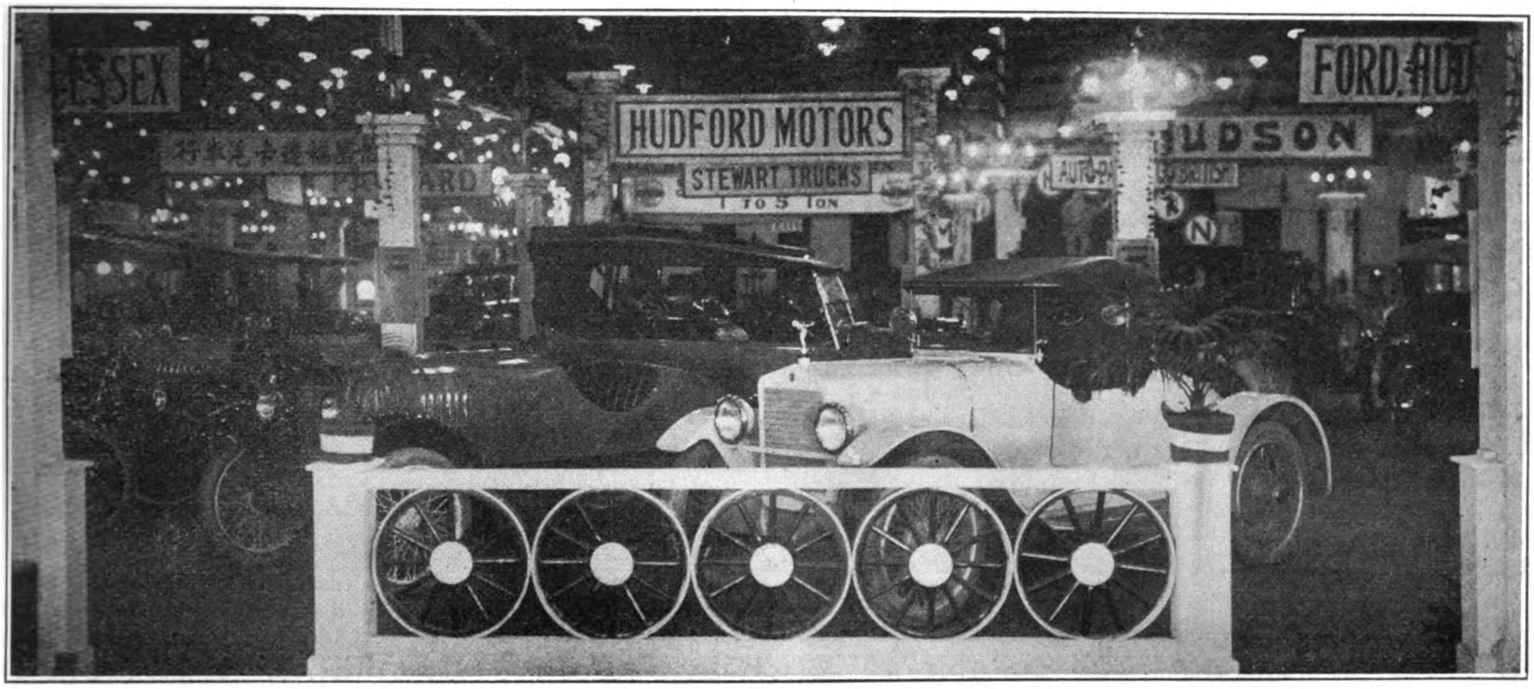


Exhibit of John Richards & Co., Ltd.



Ford, Hudson, Essex

(Dodge & Seymour (China), Limited, Exhibitors)

STAND Nos. 58-60, 65-67

FORD, Hudson and Essex cars were exhibited by the Hudford Motors, who occupied Stands 58-60, 65-67.

Dodge & Seymour made a special show of Fords in several types, from the two-seater to the limousine. A limousine chassis shipped from the Ford works and the body built by the Hudford Motors, is an exceptionally fine car, with a wheel base of 118-in. by 124-in.

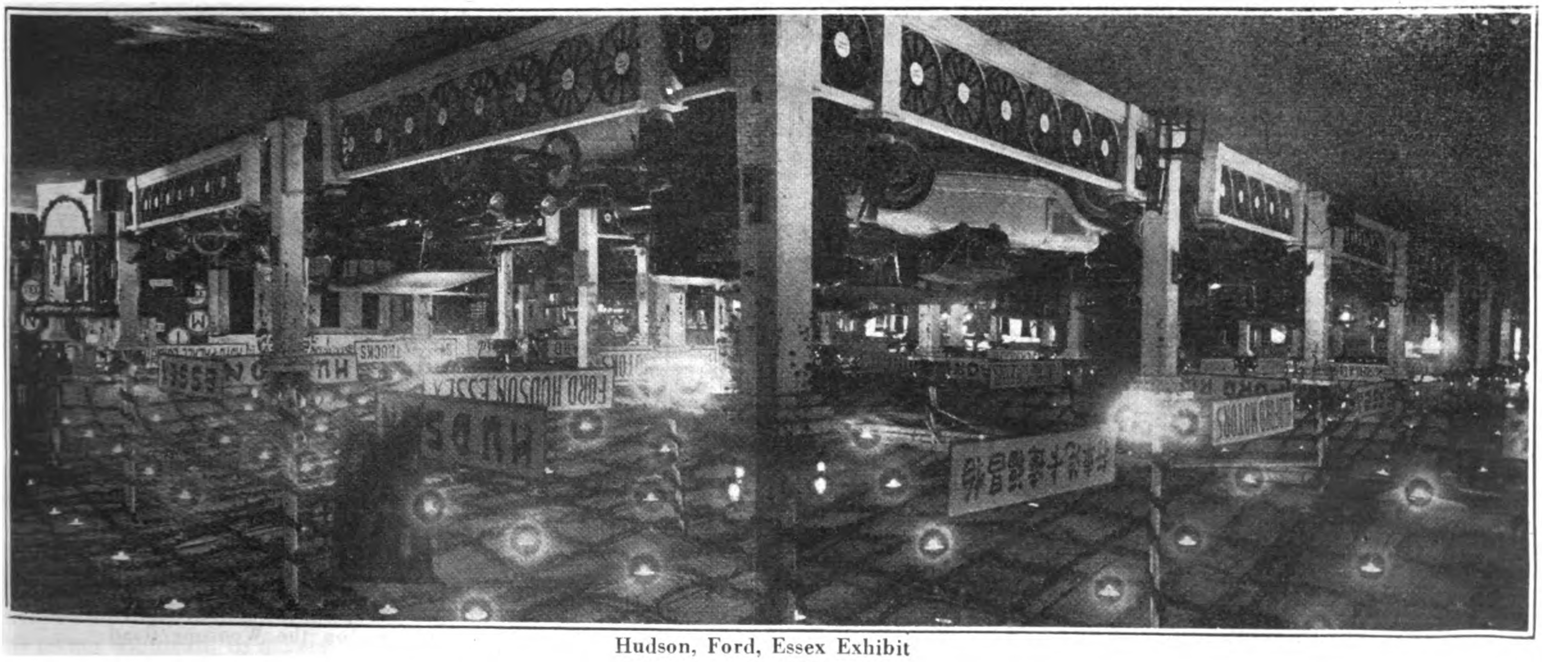
The company supply the Fords in the following types : special roadsters, limousines, landaulettes, extension roadsters and limousines, one-ton trucks, 1½ and 2-ton trucks, 2½-ton Olsen extension and Fordson tractors.

The simplicity of the Ford car, which has gained for it universal appreciation and has made it the popular car (3,500,000 people now use the Ford car), is well-known and the models exhibited by the Hudford people are worth examination.

The steel used in Ford cars is treated with vanadium and other mineral alloys, which not only cleanses the molten steel of impurities, but brings the molecules closer together, giving them greater adhesiveness and making the resulting product infinitely tougher and stronger. The steel so treated is the highest priced as well as the highest quality used in automobile construction. At the expense of several hundred thousands of dollars and a great deal of valuable time Mr. Ford worked up the formulas by which the steel is produced and heat-treated.

Hudson and Essex.—The Hudson and Essex cars were a big part of the Hudford motors show stocked in the following types : Roadsters, limousines, broughams and touring cars, the first three having special bodies.

The Hudson limousine in beauty and finish is comparable to the most costly cars on the market. Yet, mounted upon a chassis which is built in large quantities, it can be produced at a surprisingly moderate cost as compared with many cars of its type. The bodies are built with painstaking care, and in limited numbers. No detail of equipment is lacking—vanity case, smoking set, foot rest, pillows, clock, even to the silver and ivory mounting of the door latches. The excess power of the Hudson super-six motor adapts itself admirably to the larger limousine type of body, and



Hudson, Ford, Essex Exhibit

gives, without added weight, the quick acceleration so desirable in heavy and congested city traffic, together with the smooth steady power so pleasing on the open boulevard.

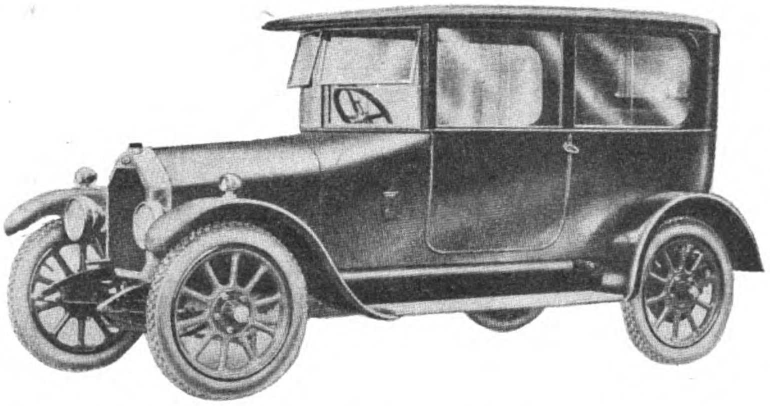
The touring offers style, comfort, beauty of line and finish and above all, performance.

In the Essex cars the five-passenger touring car is a model, beautiful in line and finish. The seats are wide and roomy. Sturdy construction assures great riding comfort and small depreciation.

* * *

The Humber Car

REPRESENTED in China by Messrs. Scott, Harding & Company of Shanghai, this well-known British car was not exhibited at the automobile show, owing to a delay in the arrival of new cars. These handsome cars are, however, a feature of Shanghai's roads and are owned by many of the most prominent taipans. The new 1922 Humber's attracted great attention at the recent



Olympia show at London where the following models at reduced prices were shown:—

11.4-h.p. 2-seater (with double dickey seat), £595: 11.4-h.p. 4-seater touring car, £620: 11.4-h.p. coupé (with double dickey seat), £725: 15.9-h.p. 5-seater touring car, £850: 15.9-h.p. saloon de luxe, £1,200.

The lively interest created by the Humber exhibit at Olympia last year and the enthusiastic expressions by the best judges on that occasion have been fully justified by the firm's experience during 1921. The 11.4 h.p. and the 15.9 h.p. models have more than maintained the high reputation of Humber productions. Indeed, Messrs. Humber, Limited, have been hard at it throughout the entire season to cope with the enormous demand. An inspection of the 1922 models will first of all reveal, side-by-side with price reductions, the introduction of several features of exceptional interest in bodywork and some notable refinements in chassis details. A new all-weather hood, standardised on the 2-seater, 4-seater, and 5-seater open cars, will prove a great boon to every class of motorist.

THE ALL-WEATHER FEATURE.—By means of this exclusive feature the open models can be easily and quickly converted into all-weather vehicles. When the hood is erected complete with the side panels, etc., it is taut and tidy looking, and there is nothing to detract from the general harmony of outline. The side panels are fitted with non-inflammable celluloid lights supported by aluminium frames concealed by the fabric covering. The light in the rear of the hood is also made from this special non-inflammable celluloid. When the panels are fitted into position they lie snugly against the inner fabric fillet, thereby effecting an absolutely weather-proof joint. They are rigid in use, and those fitted to the doors are provided with a flat metal arm, which slides into a socket in the door, the front panels being additionally secured to the wind-screen upright. All doors open easily and to their full extent, with the side panels in position. They serve a double purpose for their stiff construction renders them ideal for use as side screens when the hood is down.

THE 11.4-H.P. MODELS.—The three 11.4-h.p. cars exhibited were delightfully designed and all that can be desired in their particular class. The ease with which they are handled, the obvious strength and perfect springing of the chassis, power on hills, easy gear change and quiet running, make the Humber 11.4-h.p.'s most remarkable models in every sense of the word.

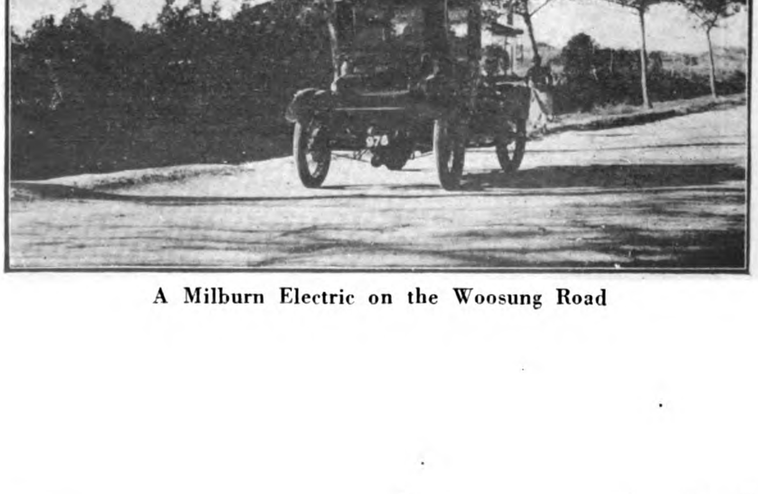
The 2-seater open model and coupé possess well upholstered double dickey seats with folding arm-rests, all enclosed in their spacious boots. The cars are richly upholstered with real horse hair stuffing and coppered springs. The covering for the 2 and 4-seater open models being first selection hand buffed leather, and for the enclosed models, rich Bedford cord.

THE 11.4-H.P. SALOON.—The 11.4-h.p. saloon, priced at £750, is a remarkable value and its graceful lines, beauty of finish and luxury of equipment fully reflect the Humber tradition.

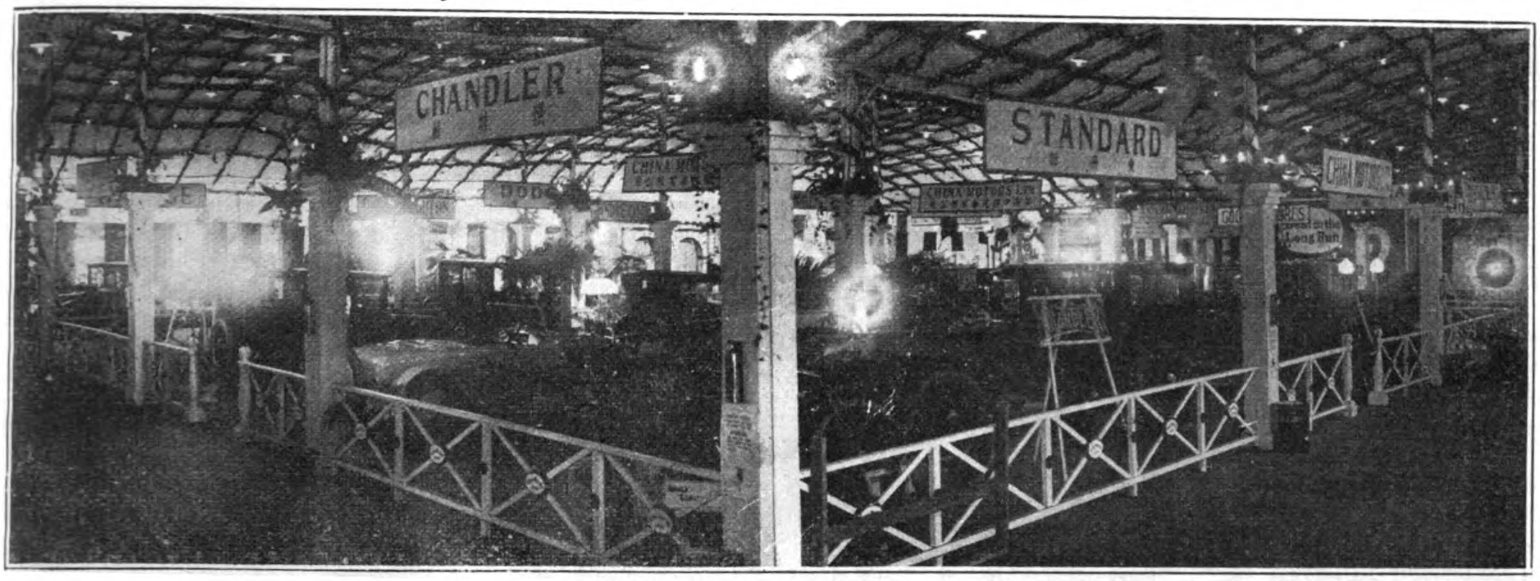
15.9-H.P. MODELS.—The 15.9-h.p. five-seated tourer and the saloon de luxe are the accumulated experience of nearly a quarter of a century of car construction, and the net result is a car of faultless design, exquisite balance, solid yet flexible construction, and refined finish. The over-all lines and general appearance of the open five-seater are as elegant as those of any car of its class on the road; its silence is one of its great assets, simplicity of control is a very strong feature, and for these and other equally sound reasons this model has been repeatedly described as the ideal car for the owner-driver.

THE SALOON DE LUXE.—This is the Humber model superb, illustrating as it does car refinement and comfort in the highest degree. It is luxuriously appointed and accommodates four passengers with every traveling facility; upholstered throughout in rich Bedford cord, and beautifully sprung. The driver's seat is of the bucket-type, detachable, and is adjustable fore and aft. The front passenger seat is of a specially designed detachable and collapsible type, folding up neatly to the side of the body, allowing free access to the driver's seat. The rear seat is exceptionally cosy, and accommodates two passengers with room to spare.

All that can be done by years of scientific study, aided by skilled craftsmanship and the use of the best materials, has been done to make the Humber cars of 1922 the most perfect examples of modern car construction. Alike in appearance, economy of fuel, and low cost of upkeep these models may be relied upon to further enhance the Humber reputation.



A Milburn Electric on the Woosung Road



China Motors, Ltd., Exhibit

China Motors, Limited

STAND Nos. 68-76

THIS concern had a most diversified and exceptionally well displayed exhibit of the many well-known machines they are agents for in China. Over a dozen manufacturers of standard automobiles have entrusted their interests to the China Motors, Ltd., foremost amongst which are the Hupmobile, Dodge, Chandler, Premier, Cleveland and Leyland, American, and the Standard, Lancaster, Crossley and Clyesdale of England, the A.B.C. and Indian motor cycles. This company has come to the front as one of the most successful in the Far East. It operates two of the largest garages in Shanghai, the Central and Eastern, and recently purchased a site on the Bubbling Well Road with a 450-foot frontage upon which will be erected the largest garage in Asia.

The new building will house all of the Company's manufacturing activities and the ten odd different makes of cars for which it is agents with a complete shop for motor and aeroplane engine repairs. The coach building floor will be one of the largest and most up-to-date in the world. Branches in North China have been opened, with a fine establishment in Peking as the Company's main subsidiary. The Star Garage of this concern is four storeys in height with a floor space of 55,000 feet and a depth of 290 feet and a frontage on Bubbling Well Road of 75 feet.

In addition to the show rooms the first floor is occupied by the body construction department which turns out coachwork equal to western plants. The forge rooms, battery charging plant and the lathe rooms are also well equipped.

Machinery for the making of spare parts have been installed in these shops. Painting and varnishing is done on the second floor and have dust proof heated rooms connected with the body building department by two large elevators.

The tire repair department with a modern steam vulcanizing plant is on the third floor.

The features of the various machines exhibited by the China Motors, Ltd., are given by them as follows:

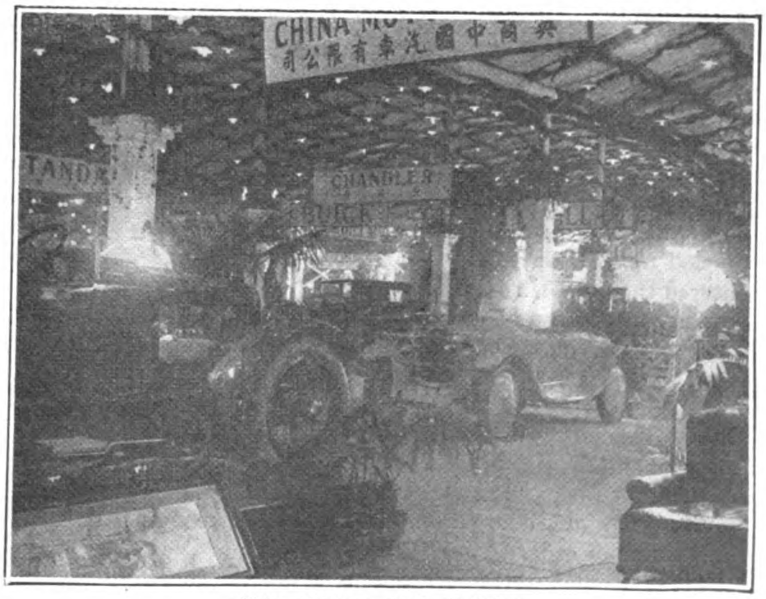
Hupmobile.—This is the most efficient four cylinder car produced by America giving a splendid performance for such an economical engine being capable of 60 m.p.h. The general design of the Hupmobile embodies the essentials of permanent style and beauty. The same scrupulous care and skilful workmanship that has earned such a remarkable reputation for the Hupmobile engine, provide a body roomy and comfortable, with equipment and appointments of the same high quality as the car itself.

Dodge.—The Dodge is only produced in one model and has been tried out over the world for years past and has stood up to the most trying condition in a very satisfactory manner. A brief examination of the chassis reveals several instances showing how the comfort of the driver and the ease with which the latter can affect adjustments have been considered. A minor point, but none the less important, is the location of the pedals for the clutch, accelerator and brake. Michelin disc wheels are used as standard equipment. Competent performance, unusual petrol and tire mileage and marked freedom from repair are a characteristic of this car.

Cleveland.—This car is produced at the Chandler factory and embodies all the fine qualities of that wonderful car on a lighter and smaller scale. In its lines of design, in the nicety of all its fittings and furnishings, and in the beauty of its finish, it reflects the ideals which created it, and which are built into it.

Chandler.—The Chandler six motor is a very marvelous engine and the general construction of this car puts it in a class entirely in its own and is doubtless the best car produced, at its price, in America. Special features that have made the Chandler motor famous include the solid one-piece aluminium motor base, extending solidly from frame to frame; the silent chain drive for the auxiliary motor shafts, three chains running in a constant spray of oil, and the Bosch high-tension magneto for positive ignition.

Standard.—The economy with which this small car can be run makes it very attractive to the man that requires utility with economy. The patented top and side curtains convert the car from a touring car to an all weather car in a few moments, and the adoption of an overhead valve engine, flexible joints in the trans-



China Motors, Ltd., Exhibit

mission, and additional oil spaces for the rear axle all tend to the efficiency of this car.

Crossley.—This car is so well known from its services rendered to the R.F.C. during the recent war that comment is superfluous.

Leyland Truck.—This chassis is too well known the world over to require any description. Its the acme of first quality English production.

Indian Motor Cycle.—These motor cycles have become a byeword in the world of sporting and hard riding motor cyclists. With frame specially designed and built to withstand the shocks and jars inseparable from travel over all kinds of roads, with steels of the highest quality entering into its construction, long life and faithful operation are assured. The maximum of economy is obtained by this engine, between 40 to 46 miles on a gallon of petrol and from 80 to 100 miles on a quart of lubricating oil is not unusual.

A.B.C. Motor Cycle.—This motor cycle is an entirely new departure. The four speed gear box gives the rider a feeling of security quite impossible to a rider of earlier motor cycles and the efficiency of the A.B.C. is maintained irrespective of climate conditions. An aircraft motor in miniature with its steel cylinders and symmetrical head design, the engine will never over heat. It can be run indefinitely on the low gears without suffering the least harm.

The H. S. Honigsberg & Co., Inc., Exhibit

H. S. Honigsberg & Company

STAND Nos. 54-64

LAST on the list of stalls but first in the size and excellence of exhibit is H. S. Honigsberg & Company, Inc., the pioneer American motor agency in China. American automotive manufacturers are indebted to the head of this enterprising concern for many of the advantages they now enjoy in this market, the result of the untiring activity on the part of the young Californian who had the vision to foresee and the sticktoitiveness to win success. From a local market limited to the sale of a few pleasure cars, the field had broadened year by year as new roads have opened up new territory. Many new concerns and agencies have entered the field, with American, British, French, German and other manufacturers keenly competing for the business, but it is fair to say that they all concede a generous word of praise to the enterprising young American who contributed so largely to paving the way for the creation of the present-day market in China. The early missionary work of this concern has been cumulative. All have benefited. Its business has kept pace with the expansion of the market, being incorporated and strengthened with a large working capital which enables it to swing successfully its increasing volume of orders.

It is needless to remark that much of the success of the automobile show is also due to the hearty co-operation and sound practical ideas of Mr. Honigsberg, who early saw the importance of such an exhibition as a means of promoting greater interest in mechanical transportation throughout China, and gave his time to its organization as head of the house committee which had charge of the exhibits. The Honigsberg stands in the show were the first to have their signs out. It is difficult in such a short article to review the many activities of this firm or adequately describe their exhibits. Suffice to say that prominence was given to their three leaders, the Buick, Chevrolet and Cadillac motors, which were displayed in various types. The features of these machines as given out by Messrs. Honigsberg & Company are as follows:

Buick Four.—The 20 h.p. model, which closely resembles the famous six-cylinder car, follow generally a design which may possibly be described from the British point of view, as more orthodox than most American designs. The engine is in appearance similar to the six cylinder Buick: manifolds and carburetor are mounted on the left side and a new type of heat control for the carburetor is used. This heat control consists of two pipes extending from the exhaust pipe in front to a heating chamber around the base of the intake manifolds. A valve is placed in the exhaust pipe at the left of the upper tube. This valve is operated automatically from the throttle valve so that at low speeds all the exhaust gases are passed around the intake manifold and at high speeds practically none of the exhaust gases pass around the manifold. This new device appears to be a great improvement, and no

doubt it is in some measure responsible for the excellent performance being secured from this engine, on test and experimental cars.

Cadillac.—The chassis of the 32 h.p. car is interesting because the Cadillac claims to be the original eight-cylinder car (at all events so far as America is concerned) there being several features embodied in the design which render it particularly attractive thermostatically controlled radiator, to mention but one. The body has the appearance of permanence of style, which would protect the owner's ability to use his car with propriety just so long as the chassis renders him efficient service. Qualities of safety, long life, comfort and roadability are combined with a body whose horizontal lines and exterior curves are significant of its ability to travel fast.

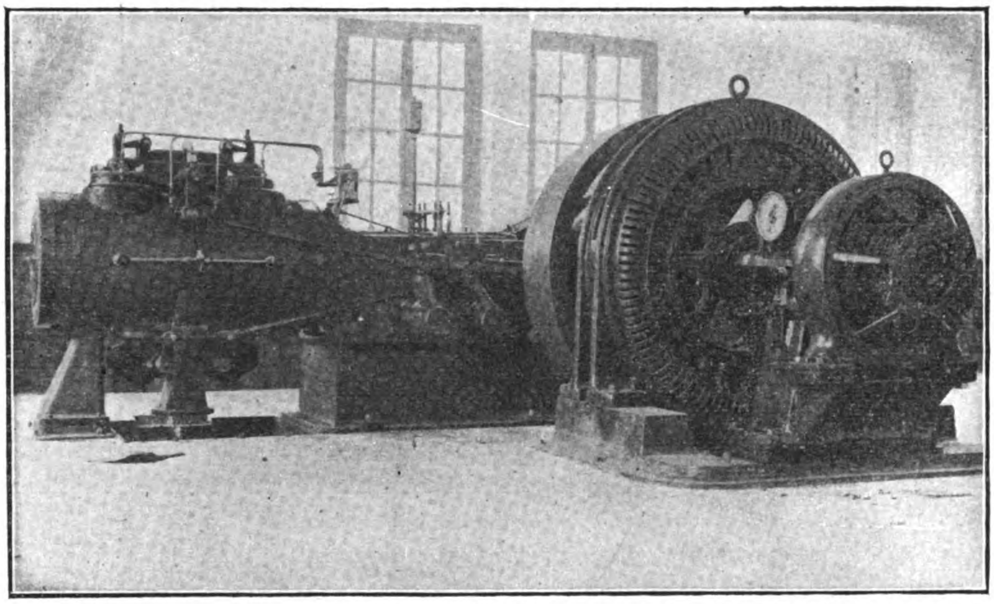
Another View of the Honigsberg Stand

Chevrolet.—It is sometimes hard to describe a famous car as it is a famous man. There are so many good points, that it is usually difficult to decide where to start to describe all the good points they possess. At all events the Chevrolet valve-in-head engine does not waste any petrol, and the valves are fitted and operated by push rods, and the cylinder head is detachable. A somewhat unusual arrangement is adopted for the brake, the clutch pedal, when fully depressed, acting on the external brake of the rear wheels, while the internal brake is operated by the orthodox pedal worked by the right foot. This pedal, however, has a tilting head, so that the brake may be locked hard on when required. A tie rod beneath the rear axle would appear to render the easy jacking up of the car a matter of little difficulty.

Two Views of the Honigsberg Exhibit

NORTHWEST MOTOR COMPANY

The Northwest Motor Company of Suiyuan has built a road from Suiyuan to Paotowchen on the Yellow River, a distance of 96 miles. The road itself, across a level stretch of country, required little more than ditching and placing culverts, and cost less than $20,000. The company operates four Denby trucks and eighteen cars with local-made bodies on Dodge chassis, seating nine persons. The average running time under favorable conditions is six hours. This company is just keeping ahead of the railway and may be expected to strike out further towards Ninghsia as the rail head arrives at the Yellow River. The company has been eminently successful under the direction of Mr. Ni, who also heads the Suiyuan chamber of commerce. It was capitalized at $200,000 and a large portion of the shares subscribed to by the tuchun, General Tsai Cheng-hsuan, later minister of war at Peking. Road building in this section of China is the cheapest part of the expense attached to the extension of motor traffic, new construction costing about the same as upkeep. In fact, roads are as such, are hardly necessary except in certain well-defined localities.



Skinner Universal Unaflow Engine with International General Electric Company Generator and Direct-Connected Exciter

Installations of a character similar to the one illustrated above have been made by us in many cities and industrial establishments in China for the purpose of furnishing electric light and power.

With a staff of experienced specialists in every branch of engineering effort, we are prepared to handle any engineering project from the point of preliminary survey, through all the detail of des·gn and estimate, up to turning over to the client the completed installation ready for operation.

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Far Eastern Automotive Bulletin

NEW ROADS, etc.

AVIATION

Chinese Hydroplane Tests.—Further successful experimental test flights have been made on the Min River, with Chinese constructed hydro-aeroplanes. The machines were operated by Mr. Hockey—a British pilot. Recent flights appear to be of considerable duration, and it is understood that very good altitudes have been obtained. According to the pilot, the hydro-aeroplanes are well constructed, reliable and economical.

Why Chang Tso-lin Needs Aeroplanes.—Chang Tso-lin had twenty Peking government's airplanes up until a short time ago but they have all been smashed and the pilots killed in accidents. It is barely possible that the Peking government would give him some of the new planes if an aviation pilot or instructor could be found who would be willing to go to Mukden. But as the available airmen are necessarily young and still love life they prefer to remain at Nanyuan where. at least, they have the satisfaction of knowing that their planes are looked after by competent mechaniciens before flights.—*P.D.N.*

Chihli Air Service.—Following the lead of General Chang Tso-lin, who recently suggested and carried through the formation of a Fengtien branch of the Chinese air force, General Tsao Kun asks the central government to create another branch for Chihli, Shantung and Honan. As chief of this branch Colonel Chin Kou-yuan has been nominated.

No Air Funds, P. I.—There is no appropriation made for the air service of the militia in the 1922 budget, according to information obtained at the Ayuntamiento.

Australia Air Services.—The federal government has decided to utilize the country's aircraft for long distance postal service and a limited passenger service. The routes include Adelaide to Sydney, 750 miles, and Sydney to Brisbane, 575 miles. The subsidy now arranged is L175,000 for the first year and L115,000 for the second year.

Hydroplanes for Canton.—Peking has received news that an engineering yard at Nantao is making hydroplanes for the Canton government. Orders have been given to the local authorities to investigate and report. The Chinese press finishes up the report by saying that the machine come from abroad and four are now being fitted up.

Two New Air Lines in China.—The aeronautical department, Peking, is planning an air line from Cheng-chow, Honan, to Shensi, and at request of General Tsao-Kun is also considering the Peking-Hankow line. However, in view of the emptiness of the treasury, these schemes may not materialize.

Aerial School in Dairen.—Mr. S. Kagawa, adviser to the aeronautic school at Mizuta, is on his way to Dairen with a view to establishing an aerial school in Manchuria. He stated at an interview prior to his departure that if he succeeds in getting a suitable tract of land in Dairen, he will remove the aerial school at Ojima in Gumma prefecture.

Air Department at Mukden.—General Pan Chu-ying, chief of the air department, is in Mukden to interview General Chang Tso-lin regarding the branch of the air department which has been inaugurated by General Chang at Mukden.

Aeroplane Transportation Company.—The Chinese consul-ganeral at San Francisco has received a petition from over twenty Chinese merchants at that place asking permission for organizing an aerial company in Chekiang, with a capital of $500,000. The consul-general has taken the matter up with the ministry of agriculture and commerce and aeronautical department, Peking.

Peking-Shensi Air Line.—While the construction of Peking-Lanchow aerial line is proceeding under the direction of the aeronautical department, the government (at the request of the Tuchun of Shensi) is preparing another air line from Peking to Shensi. An attempt is being made to raise a fund for the enterprise.

Chang Commandeers Planes.—Marshal Chang Tso-lin recently demanded that ten of the new planes received by Peking be sent to him at Mukden. In support of his demand Chang stated that he understood that a shipment of over one hundred aeroplanes had just been delivered at Peking by Messrs. Vickers and therefore the allotments to Mukden of a moderate 10 per cent. was very reasonable. The provision set forth in the Vickers loan agreement that the aeroplanes should be used only for commercial purposes was a reminder to Peking that should the aeroplanes be disposed of for military purposes in such a way the British minister would lodge a protest. Chang Tso-lin insisted that the aeronautical department in Mukden, which had been established with the permission of the Peking government, was just as important as that at Peking, and was entitled to a portion of the new aeroplanes. The despatch of aeroplanes to Mukden, he added, could not be regarded as a precedent, because there were no authorized aeronautical departments in other provinces.

The result is that several aeroplanes will be sent to Mukden under the pretext that they are temporarily loaned to the Mukden aeronautical department.

AUTOMOTIVE, ROADS, ETC.

New Maloo, Canton,—The construction of the southern extension of the Yuek Shau Maloo has been completed.

The extension is 6,000 feet in length, connecting the Ta Sha Tau station of the Canton-Kowloon Railway and the northern section of the Yuek Shau Maloo.

To Build Autos?—There is a proposal that the many shipyards in Osaka which cannot find employment now should take up the manufacture of motor-cars. Assuming that the technical difficulties can be overcome, there is an important point still to consider—the increased duty on steel and things made of steel. The shipbuilding yards supported this imposition on the strength of a promise to exempt shipbuilding steel.

Ningpo-Szechee-Chinghai Auto-Bus.—The Ningpo-Szechee-Chinghai Automobile Transportation Co., with mutual communications societies, has made considerable headway and at a meeting of promoters recently held at Shanghai it was decided that surveying should start on December 6, 1921, and that notifications to that effect be issued at the places concerned.

Chekiang-Kiangsu Roads.—In an endeavor to complete the main highway from Shanghai to Hangchow and from Shanghai to Nanking, the national road construction association is steadily going on with its works under the chairmanship of Dr. C. T. Wang. In an interview with the tuchun of Chekiang, Dr. Wang promised that the Chekiang military surveying department would take care of the survey of the highway from Shanghai to Hangchow. It is understood that Dr. Wang has made a similar petition to the military governor of Kiangsu, asking him to follow the example of Chekiang by having the Shanghai-Nanking highway surveyed so as to accelerate the completion of these most important roads.

New Road, Nanking.—The Tong-shan modern road at Nanking has been completed and auto bus service on the line has been inaugurated by the Shun Nih Co. with two automobiles.

Chinese Post Office Buying Trucks.—The metropolitan post office at Peking has ordered from a certain French firm more trucks for facilitating delivery of mail.

Auto Bus Service, Anhwei.—Mr. Sze Fong-yee has proposed the organization of an automobile transportation company to operate a service from Anking to Yin-chow by appropriating an amount which was originally raised for building the An-Tze Railway. Road will be built as soon as the capital for the company is secured.

Auto Bus Services, Fengtien.—The petition made by Mr. Yue Chiar-feng for operating an auto bus service between Antung and Dah-ku-shan, Fengtien, is said to have received favorable consideration of the authorities concerned. It is also reported that Mr. Yue has applied to the local officials for running another automobile transportation service in Fengtien, from Antung to Ling-kiang. A special feature of the new enterprise is that auto buses will run over ice between the two points.

Chefoo-Weihsien Road.—The Chefoo-Weihsien road constructed under the auspices of Chiaotungpu is approaching completion and the ministry intends to offer the completed section, about 500 *li* in length, to the public for running auto bus services thereon with an annual charge of road-repairing fee to be paid to the government. Any Chinese interested may apply to the ministry of communications for the undertaking but as the road lies in Shantung, citizens of that province shall have the preference.

New Auto Bus Co.—The Shanghai-Chuensha Automobile Transportation Co. now being organized at Pootung by Mr. Chu Shih-hsuen has been registered with the ministry of communications and agriculture and commerce.

Chekiang-Kiangsi Automobile Road.—The plan for operating an automobile transportation service from Chekiang to Kiangsi formulated by Mr. Chen Hsu-dong, ex-chief of embankment works department of Haining, Chekiang, has received the approval of the provincial authorities of Chekiang, and subscriptions to the capital of the new company have been invited.

Chefoo-Weihsien Branch Motor Road.—Mr. Chai Fan-teh, chief engineer of the Chefoo-Weihsien automobile road, has received instructions from the ministry of communications to the effect that a branch road from Pien-ping-hsien to Wai-hai, Shantung, will be built. The construction of the road will probably be carried out next spring.

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"THE" NOISELESS GEAR
FOR HOT CLIMATES

The "PEAK' PINION is pre-eminent among Noiseless Pinions by reason of the following features:—

1.—It is stronger than any other "noiseless" Pinion made.

2.—It is light in weight (not needing to be reinforced by metal plates).

3.—It is impervious to water, oil, acid and alkali.

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5.—It can be stored for any length of time without distortion.

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"PEAK" Pinions can be used wherever metal gears are employed. By their use the nerve-racking clatter of metal-to-metal gears is done away with. They are smooth-running, and have no "ring." On high-speed electric motors, for positive drives, they are essential, and by their cushioning effect not only save the companion-wheels but prevent vibration and consequent damage to both motor and machine. The Pinions are turned, bored, key-wayed, and teeth accurately machine-cut, and finished complete ready for fitting to shaft.

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(Manufacturers of all classes of Toothed Gearing),

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YOUR BARRELED SHIPMENTS

They may be China oils, hog casings or liquid egg products—packed in barrels.

The Koster Company for years has extended the service of its experts in an advisory capacity for the purpose of instructing barrel users in the proper handling of this type of packing in all its phases.

Your offices at transhipment points may not be equipped to re-condition the packing of this cargo, or to supervise the handling of it.

The department of service of The Koster Company is equipped to assist you by examining your barreled cargo, reporting on its condition, or, if you so instruct, have its coopers re-condition it.

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Construction Work of Pootung Automobile Roads.—After two months of work on the Shanghai-Nanwei automobile road, the section from Chow-chair-doo to San-ling-dong has been completed and it is generally believed that at the end of the year the road will reach Chow-poo. Work on the two cement bridges known as Hung-dah-jao and Sun-chiar-jao has been started. It is expected that service between Chow-chiar-doo and San-ling-dong will be inaugurated within the year, while through traffic on the whole line will be possible by the end of April, 1922.

With regard to another automobile road in Pootung, from Shanghai to Chuen-sha, great progress is also being made in construction work. The capital of the Company has been fully subscribed and surveying from Ching-ning-sze to Yee-chiar-jao completed. Work on two large cement bridges named Mar-chair-pang-jao and Dao-kiu-jao, will soon commence and are expected to be finished next March. The road will have a width of 40 feet except at the most prosperous section from Ching-ning-sze to King-chiar-jao where it will be 50 feet wide.

Shanghai-Taichong Automobile Transportation Co. Ready to Oporate.—The construction of the motor road from Chapei to Lu-tien, about 30 *li* in distance, has been concluded by the Shanghai-Taichong Automobile Transportation Co., and an auto bus service will be inaugurated on January 1st, 1922, with five new buses each capable of accommodating 10 passengers in the first class and 16 in the second class compartment. These cars, of American manufacture, cost about Tls. 4,500 each. A trial service of the new buses will be made shortly, making a round trip to Woosung, passing through Yangtszepoo and military roads.

In addition to the auto buses, the Company will purchase several motor cars for general service.

Soochow-Kashing-Huchow Automobile Transportation Co.—With reference to the Soochow-Kashing-Huchow Automobile Transportation Co. proposed by Mr. Chen Wei-yu with a capital of $3.000,000, it is learned that the following five roads will be built:

(1) Starting from Soochow, running eastward via Kwan-shan and Tai-chong to connect with the Shanghai-Taichong automobile road leading direct to Shanghai.

(2) From Soochow to Kashing via Huchow.

(3) From Huchow to Kwang-teh leading to the Anhwai provincial road.

(4) Starting from Soochow, passing through Chang-zao and Fu-shan-ching leading to the Yangtze River.

(5) Starting from Kashing and ending at Hang-chow Bay via Ping-hu and Chapu.

As the first line will connect with the Shanghai-Taichong automobile road, negotiations are being carried on between the two auto bus companies for joint service.

New Road, Nantungchow.—Since the removal of Nantungchow city wall many new structures are being planned.

For facilitating communication, the public works department will build a modern road from Yu-wu-jao to Tsi-fai-tien via Mar-chen-mu connecting with the Chung-hsuan-shan road at Hao-pei.

Chenkiang-Wusih Auto Bus Service.—At a meeting of the promoters of the Chenkiang-Wusih Automobile Transportation Company, it was decided that auto buses would be run on rails to be laid out along the motor road. A set of regulations has been laid down and application for approval and registration made to the local authorities.

Shanghai-Minghong-Nanwei-Tsoling Auto Bus Co.—The Shanghai-Minghong-Nanwei-Tsoling Automobile Transportation Co., under the managership of Mr. Lee Ying-shih, in co-operation with the authorities, has begun the purchase of lands for the construction of motor roads through four districts, aggregating 91 *li* in length. There will be built seventeen re-inforced concrete bridges before June, 1922 when auto bus services will be inaugurated. Construction of the bridge at Tsao-hu-ching with an arch of 30-ft. wide and the one at Chang-chiar-ping with an arch of 20-ft. wide was started on the 8th inst., while the others from Pao-nan to Tso-lin will be commenced on the 18th inst.

Shanghai-Tsoling Auto Bus Co.—While the Shanghai-Mingkong-Nanpoo-Tsoling Automobile Transportation Co. has recently placed an order with Leewoo & Co., a German firm, for ten passenger and freight cars. The former costs Tls. 2,700 each and the later Tls. 2,750 each, and the cars are expected to arrive at Shanghai in April, 1922.

Shensi Auto Bus Service.—General Tsao Kun has promised to set apart twenty automobiles for running a service between Sian and Dung-kwain of Shensi.

Chefoo-Weihsien Motor Road Traffic.—An auto-bus service has been inaugurated on the Chefoo-Weihsien road as far as to Sha-ho, the western boundary of Yih-hsien, a distance of over 200 *li*, from Chefoo. The section between Sha-ho to Chiar-ho in Cho-yuen-hsien, on which bridges have been completed, will be ready for traffic next spring.

Motor Works Burnt.—Damage estimated totaling about Y.800,000 resulted from a fire in which nine of the factories of the Tokyo Street Motor Car Company at Senjyu in the suburbs of Tokyo were destroyed. About 60 motor cars awaiting repairs and in course of construction were destroyed.

Tractors in the Philippines.—The increase in the use of tractors has been remarkable. In 1917, 4 tractors were sold in the Philippines; in 1918, 6; and in 1919, 597, while during the fiscal year ended June 30, 1920, over 800 were sold. This great increase was largely in consequence of a tractor demonstration held at the government demonstration farm at Alabang in October, 1919, where 10 tractors were tested under the most exacting conditions. As a result of these trials, tractors won a place in Philippine agriculture. It was found that a tractor meeting the conditions should be able to pull three 14-inch plows and should have 12 horse-power at the drawbar always available. Fourteen-inch moldboard plows and 26-inch disk plows were found to be most satisfactory, depending on different conditions of soil. For several years there has been an increasing shortage of draft animals in the Philippines, due to the prevalance of rinderpest among the carabaos, and for that reason it has been necessary to find another means of motive power. This accounts in part for the general increase in the use of tractors, and while there are certain uses for which the carabao is indispensable, yet the indications are that the tractor will soon supersede the carabao to a very large extent in supplying motive power.

Roads in Heung Shan.—Mr. Wu Tit-sing, the new magistrate of Heung Shan, has proposed to open the public roads in the city. Ten surveyors were employed from Canton to make surveys.

Canton Roads.—The survey of a public road from Canton to Tsing-Sing district, which was proposed by the public road bureau, is now finished says the *Canton Times*. The road will start from Sha-hoo, outside the east gate, *via* Inn-tong and through the foot-path of the white cloud mountain directly to the district of Tsing-sing. The road line is estimated to be more than 60 miles. The work will begin soon.

The public works department issued an announcement that several maloos will be opened in Saikwan in order to facilitate communications in that part of the city.

Starting from the western end of Sap Sam Hong Street, a 40-ft. maloo will be built to the eastern end of the street with a 10-ft. sidewalk on each side of the maloo. Another maloo of the same width will connect the west bund and the present Sap Sam Hong Street. The Wing Yang Street and the Tak Cheng Street will be widened to 20 and 24 feet respectively.

The above schedule has been approved by the executive council of the municipality and P.W.D. officials are surveying in these places.

Road Construction, Kashing.—Mr. Kao Shu-li, chairman of the chamber of commerce at Kashing, Chekiang is raising a fund for constructing a modern road along See-hu Street from East City Gate to North Gate.

Road Construction: Woosung.—The Woosung port improvement work bureau has officially announced that roads along the Woosung Creek and Sze-dong starting from the station of the Shanghai-Woosung railway on the east and ending at Tsi-shun-an Bridge on the west, which have been surveyed and for which tenders have been called, will be soon constructed.

Auto Bus Service, Harbin.—An automobile service from Harbin to Ching-hua-chuen viâ Shan-sing, Chiar-mow and Sze-foo has been inaugurated.

Automobile Co., Increases Capital.—The Shanghai-Nanway Automobile Transportation Co. is now being organized, has announced the increase of its capital to $500,000 as authorized by the committee to extend the proposed service.

Automobile Road, Kiangsu.—Messrs. Wang Mow-ting and Yao Pao-teh, gentry of Zingkiang, have planned to build a modern road between Zing-kiang, Kiangsu, from Pai-yu-kong-kow, 18 *li* in distance, and operate a auto bus service. A meeting was held in the local chamber of commerce and a fund of $3,000 has been so far obtained.

North Automobile Co.—Auto bus service of the Pei Fong or North Automobile Transportation Company was inaugurated between Sao-tsian, Anhwei, and Hsuchow, Kiangsu, viâ Yung-chen and Kwanteh in Honan and Bao-hsien in Anhwei. The fare from Sao-tsian to Hsuchow is $6 for a single journey.

Provincial Roads, Kwangsi.—Reports from Wu-chow state that the Kwangsi provincial road construction bureau consisting of four departments has been formed with Mr. Soo Wu-yah as director. According to the schemes formulated by the bureau, the road from Mong-kiang to Kwei-ling will be built first, as it is a highway, very important in military service. A fund will be appropriated for preliminary servey of the line.

Paved Road at Nantungchow.—At Hao-nan, Nantungchow, a modern road, 12 *li* long, has been completed, and inauguration ceremony was celebrated on December 1, 1921.

Heilungkiang Auto Bus Line.—From Heilungkiang to Heiho, a distance of about 800 li, an auto bus service is operated every winter when the bandits are most active. The company is preparing to resume business this winter.

Canton Motor Bus Line.—The motor bus line in Canton is operating 15 trucks, equipped with passenger bodies of a Chinese-make and each truck hauls a trailer which is similarly equipped. One unit, consisting of a truck and trailer, has a seating capacity of 70 persons.

Canton is a city of over 1,000,000 population, and, until only a year or two ago, when reconstruction work was begun, there were only 15,000 feet of road in that city sufficiently wide to accommodate wheeled traffic. That stretch of road was along the water front. In 1919 work was started to tear down the old city wall, build a modern road in its place, and remodel the city streets on a more modern plan. With this work recently completed, the new motor bus service was put into operation.

Regular fast service, 15 hours a day, to any part of the city is now given the populace of Canton.

The Shanghai-Taichong Long-distance Automobile Company will commence its service from Chapei to Lutien in January 1922.

Motor Service, Peking.—Hu Teh-kung, of Peking, has petitioned for permission to inaugurate a passenger and goods motor service between Nanyuan and Peiyuan, Peking.

The Yue K'ang Transportation Company, Ltd., has been organized by Mr. Yuan Chi-wu with a capital of $100,000. Its head office is at Hsuchow, Kiangsu. The ministry of agriculture and commerce has been petitioned for registration.

Chinese Automobile Company.—The Yangtze Machinery Works has turned out an automobile, which, when compared in quality and workmanship, is stated to be in no way inferior to foreign makes. Patent rights have been obtained from the ministry of agriculture and commerce. The company intends to enter into competition for the China market with other manufacturers.

Harbin Motor Truck Service.—The Russo-Asiatic Bank, Harbin Pristan, whose telegraphic address is "Sinoprist," notifies that orders of every description for handling and forwarding of goods by rail will be accepted at its counters. The bank has godowns situated in various parts of the city for storage of all kinds of merchandise and cellars, specially arranged for storage of wines. Delivery of grain for storage can be made at the Anda Station of the C.E.R.. The transportation of goods within the boundaries of the city is effected by means of motor trucks.

Road Construction, Kwangsi.—A sun of $60,000 has been appropriated by the magistrates of Nanning and Pingchow, Kwangsi, for the building of a road between the two cities.

INDUSTRIES

The Tung Hua Cotton Mill at Ward Road, Shanghai, a Japanese enterprise, will erect a second mill at the northern side of its premises, with machines imported from the United States.

New Arsenal, Mukden.—The Mukden arsenal was originally intended to have a capital of $4,000,000, of which one-half was to be provided by Fengtien and one quarter each by Kirin and Heilungkiang, but as it is to be extended the amount is insufficient. General Chang has now decided that another four million dollars are needed, of which one-half is to be raised by Fengtien and the other half by Kirin and Heilungkiang.

Fengtien Arsenal.—On the occasion of a banquet given to the managers of leading Chinese banks at Harbin by the tuchuns of Kirin and Heilungkiang, General Sun Li-chen and General Wu Tsing-sung stated that one of the important objects of their visit to Harbin was to arrange for the organization of an arsenal at Lien-shan-wen, Fengtien, as proposed by Marshal Chang Tso-lin. As the scheme will call for an enormous expenditure, they asked for assistance of the local financiers. Fifty per cent. of the fund required is to be raised from Fengtien, thirty per cent. from Kirin and twenty per cent. from Heilungkiang.

New Iron Works.—The ministry of agriculture and commerce has granted registration to the China Iron Works, Ltd.

Flour Mill, Shanghai.—The Shun Hua Paste Manufacturing Co. has announced an increase of capital by one million dollars, to be used for erecting a flour mill at Sao-shiao-doo, Shanghai. The factory building has been completed and machinery installed.

Glass Factory, Mukden.—A glassware manufacturing company is under organization at Sikwan, Mukden, by Mr. Fu, an experienced expert in that line.

New Dyeing and Weaving Co., Shanghai.—The Sing Hua Dyeing and Weaving Factory, promoted by Mr. Yih Ting-sing about three years ago, has now completed its preparatory works. The factory building is located at Chapei and the office is at Lao-cha-jao. When machinery ordered from abroad has been installed, operation will commence.

Shanghai Soap Factories.—There are more than thirty soap and candle manufacturing companies in Shanghai established by Chinese.

A New Printing Company, Hangchow.—The Chekiang Printing Company, capitalized at $50,000, is being organized at Hangchow by Messrs. Jue Sun-pai, Chu Hung-tan, Chang Ju-chuen, Kao Tze-ting and Chang Mong-lin.

New Mill, Nantungchow.—The construction of the Dah Sun Cotton Spinning and Weaving Factory, mill No. 8 at Kiang-chiar-jao, Nantungchow, is making good headway. The structure is of re-inforced concrete. Machinery, spindles and other equipments ordered from abroad have arrived.

Phosphorus Factory, Tsinan.—The Shantung Agricultural Association at Tsinan has proposed the organization of a phosphorus factory to supply materials to Chinese match factories. A meeting was held by the association and a number of local merchants interested.

Textile Plant Expands.—The Dah Sun Textile Plant at Tang Cha, Nantungchow, has decided to increase its capital by $22,000 for purchasing additional machinery and expanding its factory building.

Silk Mill, Chinkiang.—The Tan Hua Silk Mill to be run by electric power is being organized at Tan-yang, Kiangsu, with a capital of $100,000. Mr. Tan Tsuh-chung is appointed as general manager and Mr. Kwan Wei-way as assistant manager and engineer-in-chief. Its factory building is in the course of construction and operation is expected to commence in next spring.

New Fishing Co., Snanghai.—The Kiangsu and Chekiang Fishing Co., Ltd., is being organized at Shanghai by Messrs. Lee Sui-kiu, Hsu Han-nan, Woo Tseng-ching, Chao Sing-ming, etc. It is to have a capitalization of $2,000,000, divided into 100,000 shares of $10 each.

Industrial Development of Fukien.—Rapid improvement has been made in Fukien's industry during recent years, and a number of industrial plants organized. Among these, the largest is the Fukien Industrial Company at Foochow, manufacturing alcohol and leather. The factory is equipped with up-to-date machines and stocked with a large quantity of raw materials. At the alcohol plant, there is an artesian well having a depth of 270 feet, capable of supplying 2,000 piculs of water per hour. The alcohol is made from potatoes.

Kien Hua Match Factory, Lee Hua Silk Filature, Mei Lee Soap Manufacturing Co., Tseng Chung Cloth Weaving Mill and Foo Hua Factory are also noteworthy, their products enjoying a good sale on the market.

Paper Mill, Kirin.—A petition has been submitted to the ministry of agriculture and commerce by Mr. Pao for organizing the Shun Ling Paper Mill at Kirin.

Beet Sugar Refining Co., Manchuria.—The beet sugar plant at Foolan, Manchuria, run by Chinese officials and merchants since its re-organization, has made great improvement under managership of Mr. Yue Ching-dang.

Cigarette Factory, Shanghai.—The Nan Yang Bros. Tobacco Company propose to erect a new factory. It is reported that the company has purchased more than 20 *mow* of land at Yangtszepoo for this purpose.

Paper Manufacture, P.I.—The office of the bureau of foreign and domestic commerce of the United States in Manila has been conducting an investigation of the possibilities of paper manufacturing industry in the Philippines. It is believed that such an industry if efficiently managed, can count not only on the local demand, but also on China, whose consumption of imported paper has been increasing yearly.

Cold Storage, N.E.I.—The East Java Cold Storage Company, recently formed, will shortly start business at Sourabaya and Samarang. The company will deal principally in Australian meats, game and fruit.

Cotton Spindles in Japan.—An investigation made by the Japanese Cotton Spinners' Association revealed that on August 1 there were 3,963,528 spindles (3,914,158 ring spindles and 49,370 mule spindles) installed in the mills of the companies belonging to the association, an increase of 149,948 spindles over the number at the end of 1920. In yarn-twisting machines the spindles amounted to 51,791, showing an increase of 1,208 machines. The number of spindles of the companies which do not belong to the association is about 160,000 spindles, which will make, if added to the above total, more than 4,000,000 spindles. The companies which are not members of the association are mainly making fine yarns and calico yarns, and have an output of about 5,000 bales a month.

Development of British Indian Sugar Industry.—India has an annual consumption of 748,544 tons of foreign sugar, with a production of refined sugar of only 177,569 tons. It is obvious that there is ample scope for many times the number of factories now working in India. The prospect before the Indian sugar industry is very hopeful, as it can choose the most favorable parts of the country for supply for many years to come, and with the increased duty on foreign sugar, coupled with heavier freight and handling charges, it is considered that it would be well if capitalists devoted their time and attention more and more to developing the industry on a sound and scientific basis. There is ample scope, and the rise in the cost of production throughout the world, both of raw material and of the finished product, has told heavily in India's favor.

Heating Power House, Tokyo.—Establishment of a power house to supply heating systems in Tokyo is being considered by Mayor Goto who has called a German engineer to study the fuel problem which hitherto has prevented installation of the system. The engineer is experimenting with lignite as a fuel for generating gas and if the experiments are successful the establishment of the power house will not be long delayed, it is said.

Agricultural Machinery, F.E.R.—The Blagoveschensk department of industry has undertaken to carry out the extensive orders of the central government for the construction of agricultural machines and implements. To fulfil the orders the Chepurin and Afanassiev factories will be run full blast.

ARSENALS

Site of the Mukden Arsenal.—The agricultural experiment station at Mukden has been chosen as the site for the Fengtien arsenal. The architects' drawings for the new buildings have been submitted to General Chang Tso-ling for approval. Although tenders for constructing the arsenal will be invited next spring, a fund of $3,000,000 to meet construction cost having been appropriated, it is reported that Mr. Dac Lee-tsing, director of the Mukden arsenal, has sent a representative to Sweden to purchase machinery for manufacturing munitions. The light railway to connect the arsenal with the main line will start from the Peking-Mukden Railway station passing through Hsiao-Pei-pien-men, Dah-pei-pien-men and Hsiao-tung-pien-men direct to the arsenal. Mr. Foo Pao-kong has been appointed to take charge of the work which will be probably started within the year.

大正七年七月十日第三種郵便物認可

MAR 21 1922

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

遠東時報

上海仁記路第五號

THE PACIFIC CONFERENCE

CHINA'S VICTORY

Japan's Brilliant Come-Back

FAR EASTERN HARBORS

SHANGHAI
NEWCHWANG
SINGAPORE
RANGOON

FORMOSAN SUGAR INDUSTRY

INDO-CHINA RAILWAYS

N. E. I. RAILWAYS

KOREAN INDUSTRIES

Vol. XVIII February, 1922 No. 2

SHANGHAI, PEKING, TOKYO AND MANILA

A. L. TAYLER

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2-2½-ton Long Char-a-bane Chassis	**£750**	£1,007	***£257***
3½-4-ton Lorry Chassis	**£865**	£1,195	***£330***
3½-4-ton Char-a-bane Chassis ...	**£880**	£1,190	***£310***
4-ton Long Wheelbase Omnibus Chassis	**£950**	£1,200	***£350***
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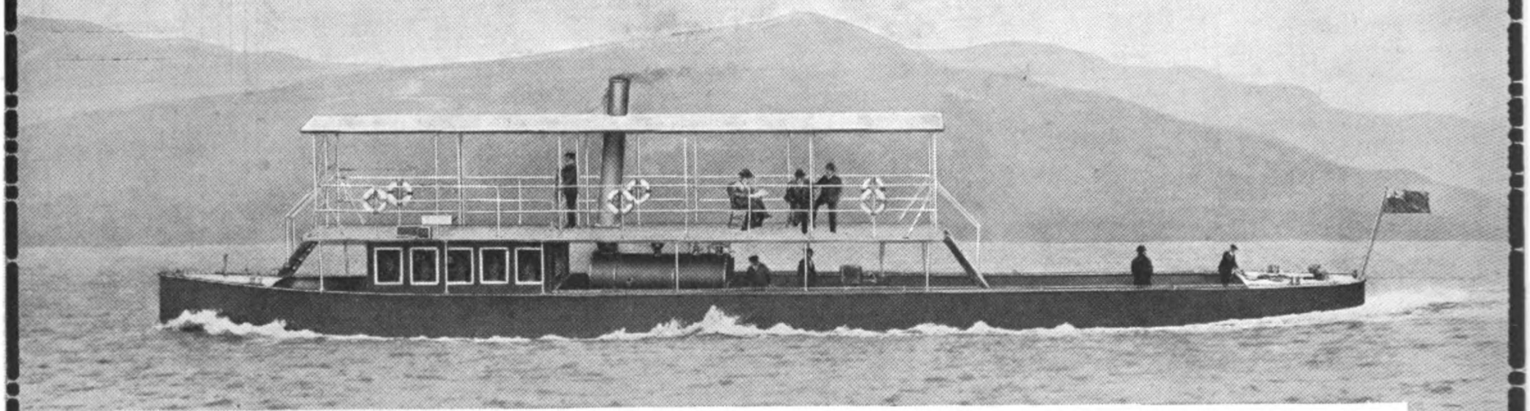

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, FEBRUARY, 1922 No. 2

SIDELIGHTS ON THE CONFERENCE

TWO years ago, America rejected the League of Nations, spurned a tripartite alliance for guaranteeing the safety of France against possible future German aggression, and to-day accepts a four power treaty embracing the essence and principles of the Wilsonian league, with an Article Ten thrown in, to cover the Pacific insular possessions of the signatory powers. We refused to ratify an alliance which compromised us to come to the aid of France and then invited the latter to enter into an agreement which guaranteed our possessions in the Pacific, providing the opportunity for M. Viviani (heading the French delegation at Washington) to remark, " France will assume all of the obligations that fall upon her in the treaty. France has never declined to stand by her plighted word. When there has been a question of standing by her plighted word or taking up arms, France has never hesitated."

The four-power treaty comes to supersede the Anglo-Japanese alliance and brings the United States into a miniature Far Eastern League of Nations which takes on the character of an alliance for the protection of island possessions in the Pacific. There is little difference between Clause Two of the new treaty

THE NEW PACIFIC TREATY

I.

The high contracting parties agree as between themselves to respect their rights in relation to their insular possessions and insular dominions in the region of the Pacific Ocean.

If there should develop between any of the high contracting parties a controversy arising out of any Pacific question and involving their said rights which is not satisfactorily settled by diplomacy and is likely to affect the harmonious accord now happily subsisting between them, they shall invite the other high contracting parties to a joint conference to which the whole subject will be referred for consideration and adjustment.

II.

If the said rights are threatened by the aggressive action of any other power, the high contracting parties shall communicate with one another fully and frankly in order to arrive at an understanding as to the most efficient measures to be taken, jointly or separately, to meet the exigencies of the particular situation.

III.

This treaty shall remain in force for ten years from the time it shall take effect, and after the expiration of said period it shall continue to be in force subject to the right of any of the high contracting parties to terminate it upon twelve months' notice.

IV.

This treaty shall be ratified as soon as possible in accordance with the constitutional methods of the high contracting parties and shall take effect on the deposit of ratifications, which shall take place at Washington, and thereupon the agreement between Great Britain and Japan, which was concluded at London on July 13, 1911, shall terminate. The Government of the United States will transmit to all the signatory powers a certified copy of the proces-verbal of the deposit of ratifications.

The present treaty, in French and in English, shall remain deposited in the archives of the Government of the United States, and duly certified copies thereof will be transmitted by that Government to each of the signatory powers.

The following provisions are in the form of a separate agreement signed at the same time :

In signing the treaty this day between the United States of America, the British Empire, France and Japan it is declared to be the understanding and intent of the signatory powers :

1. That the treaty shall apply to the mandated islands in the Pacific Ocean ; provided, however, that the making of the treaty shall not be deemed to be an assent on the part of the United States of America to the mandates and shall not preclude agreements between the United States of America and the mandatory powers respectively in relation to the mandated islands.

2. That the controversies to which the second paragraph of Article I. refers shall not be taken to embrace questions which, according to principles of international law, lie exclusively within the domestic jurisdiction of the respective powers.

Washington, December 13, 1921.

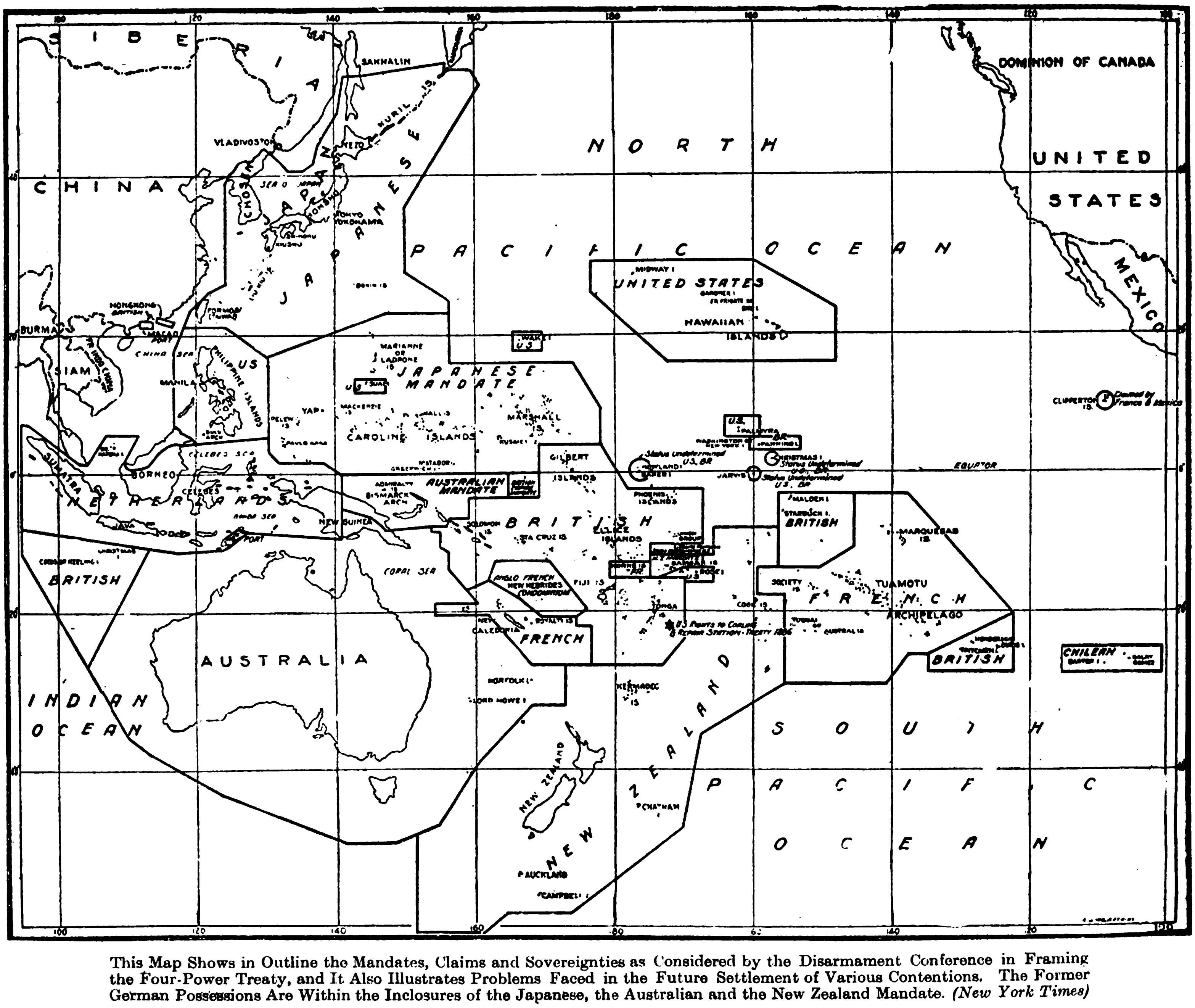
and Article Ten of the League of Nations which expressly undertakes to guarantee the territory of its members against external aggression, but in regard to doing this it provides : " In case of any such aggression or in case of any threat or danger of such aggression, the council shall advise upon the means by which this objection shall be fulfilled."

The difference between the two is slight, and, in effect, the Pacific treaty is one of alliance with teeth in it, which is as it should be, if it is to carry out its purpose. America has come out of her seclusion, and entered upon a new world career which makes us a partner of Japan in upholding the peace of the Pacific and confirming each power in its possession and enjoyment of lands now held by them under mandate or in trust for their lawful owners.

As was to be expected, the treaty has re-opened the partisan feeling that characterized the fight over the League of Nations, with the republicans standing behind a jubilant administration and the democrats waiting for the physchological moment to spread consternation amongst the merry-makers. The fact that the treaty has the full support of those who killed the Versailles treaty goes to show that the real reason why the latter was blocked by the Lodge forces in the sénate was simply because it was proposed by a democratic administration, and the republicans slaughtered it "to get even with Wilson." Wilson's friends are keeping quiet, and, although there are indications that an effort will be made on the part of the democratic leaders to block the treaty, their tactics will tend more to holding up the republican party to the ridicule of the nation for its partisan politics in defeating the Versailles treaty. The leading democratic papers concede that it meets with the general approval of the country, and is accepted as a belated republican indorsement of the League of Nations, leading in the near future to American membership in the league, and so vindicating their leader and furnishing the democratic party with campaign material for the next presidential elections. The irreconcilables headed by Senator Reed of Missouri can be depended upon to fight ratification of the treaty. Borah is keeping silent. Johnson's attitude has not been disclosed and La Follete can usually be depended upon to fight anything.

On the other hand, the Democratic *Brooklyn Eagle* warns us that " we are in for a fight on the treaty. One of the chief arguments which will be offered against it is that there are certain points of doubt as to just what it includes or involves." Indications are that an attempt may be made by friends of China to kill the treaty in the same way they assisted in hamstringing the Versailles treaty, simply because of a feeling that Japan has come out of the conference with greater power and prestige than when she went in, and that China's rights have not been sufficiently restored. It

MAP OF THE PACIFIC UNDER FOUR-POWER TREATY



This Map Shows in Outline the Mandates, Claims and Sovereignties as Considered by the Disarmament Conference in Framing the Four-Power Treaty, and It Also Illustrates Problems Faced in the Future Settlement of Various Contentions. The Former German Possessions Are Within the Inclosures of the Japanese, the Australian and the New Zealand Mandate. *(New York Times)*

JAPAN'S DELEGATION AT WASHINGTON

Admiral Kato | Prince Tokugawa | Ambassador Shidehara | Vice-Minister Hanihara

is needless, however, to say that any such tactics will lose for China the friendship of the other powers and lay her open to the renewed charge of being an obstacle to peace. "A people incompetent to run their own affairs should be very careful about intervening in the affairs of other strong, well equipped nations who have been brought to the verge of war by the inability of China to govern herself and preserve neutrality or sovereignty."

"Two months ago," writes Frank H. Simonds in the *Review of Reviews*, "I told my readers that there was every sign that the United States and Japan were drifting toward war in the Far East. Since Chinese conditions are what they are, it would be rash to forecast that all danger has been removed, but at the least all apparent danger has been eliminated and the mutual misunderstandings and apprehensions of the two nations have been enormously reduced if they have not been finally banished. If this were the sum total of achievement of the Washington conference it would still justify the wisdom of the president in calling it and testify to the loyal service of all who participated in it."

The consensus of American opinion favors the treaty as a splendid conception, removing all sorts of causes for serious disputes, a base upon which may and should be founded a far more extensive co-operation. The fact is generally acclaimed that the president and Secretary Hughes have worked out a plan that will insure peace and lighten the intolerable tax burdens of a suffering and impoverished people and opinion is strong that the treaty should be ratified promptly and obstructionists swept out of the path. What happened two years ago, will not be tolerated at the present time.

When it was discovered that the four-power treaty extended over the Japanese homeland according to a private agreement made by the American delegates, the only reasonable inference was that Japan had exacted this guaranty as the price of scrapping the Anglo-Japanese alliance, which provided the enemies of Japan with the opportunity of charging her with descending to trading tactics. But, as the *New York World*, declares, "nothing more extraordinary has come out of the Washington conference than the report that the Japanese object to the guarantees of the four-power treaty and are asking that Japan proper be excluded from its provisions."

With the final ratification of the four-power treaty the old Anglo-Japanese pact will automatically fall into the discard. Everybody should be satisfied to this outcome of a most distressing situation. Great Britain lives up to her traditional reputation for playing the game, standing fairly by her ally until a new and stronger instrument takes over her obligations. The pressure upon Britain last year to terminate the alliance and isolate Japan was tremendous. Condemned by her Pacific dominions, appealed to by America and villified by China for the existence of an alliance which had carried Japan to the point where she was considered a menace, the attitude of the British government throughout has been one that compels admiration for the generous, whole-hearted manner in which she stood by her partner. For this was the real crux of the conference, the pivot around which all the minor questions revolved. Japan went to the conference in fear and doubt with the menace of isolation and relegation to the rank of a second rate power staring her in the face. The tirades of the anti-alliance party in England, the thunderings of Northcliffe and his satellites, the clamor in America and the strenuous propaganda of China created a public opinion before which a weak British government might have bowed and condemned Japan to face the world alone. British opinion as a whole, however, was not influenced by the vigorous campaign to isolate Japan, and as typical of the general attitude on the question, the *Dundee Courier* says:

"Japan, on the other hand, has many coincidences of circumstance and interest with the British empire. She, too, is an island kingdom, and she proved a faithful and powerful ally in the war. These are facts which must be remembered when there is easy talk about cancelling the alliance. What are we to put in its place? A vague assurance of friendship from the American government of the day?

"There must be something more solid than that. If America can give a definite guarantee, well and good. If Britain, America and Japan can forge a triple alliance that would be best of all."

That Japan emerges from the conference stronger than ever is due largely to the fidelity and honor of her ally. Japan's place as a first class power, one of the Big Four, is now assured to her.

True, the new pact cannot be called a substitute for the old alliance which gave specific guarantees. Disagreements between the contracting parties are to be brought before a joint conference of four. It is, as Mr. Frank H. Simonds points out in the *Review of Reviews*, a guarantee of the *status quo*, but not a guarantee to maintain it by our force, but by our good behavior--just that and nothing more." The difference in the two treaties as explained by Mr. Hanihara, "was the difference between whisky and water," but such as it is, it is accepted by the Japanese as constituting a promise which is to take the place of the Anglo-Japanese alliance.

As the elimination of the old alliance was one of the primary objects of the conference, Americans must remain content and accept the responsibilities and obligations which the new line-up places upon us. We willed it so. It was our party. We must play the game and not cry baby, as we did after Paris. China is not satisfied. Her publicists are crying to heaven that they have been betrayed, that Japan is now in a stronger position than ever to work her will in Asia. This, notwithstanding that Japan has subscribed to all the committments upholding China's sovereignty, integrity and the "open door." It is difficult at times to understand just what the Chinese *do* want. Last year they sent their most able publicists to America and Europe to oppose an extension of the Anglo-Japanese alliance. They have succeeded. All credit must be given to them for the manner in which they presented China's side of the case. The British and American governments and British merchants in China menaced with a boycott perhaps will not endorse the methods employed in their campaign, but they did their duty as they saw it. Yet the Chinese are disappointed and criticize the weakness of their leaders and publicity methods. They are hard to satisfy. They wanted to isolate Japan and place her in the dock before the court of nations. They might have succeeded had it not been for Great Britain. China overplayed her hand, and while Britain accepted the necessity of terminating the pact, it was done in an honorable manner.

Japan's Brilliant Come-Back

Japan has had an amazing success in the Pacific conference and has come out with a rehabilitated reputation amongst Americans. Her chivalry and sense of justice have triumphed. She has met us half way and it now devolves upon Americans to set aside their prejudices and go the other half to clasp hands with her. We must co-operate with her morally and financially to strengthen the hands of the liberal element in Japan who talk the language that we understand. American capital can help. So can the government. JAPAN HAS EARNED THE RIGHT TO CORDIAL CO-OPERATION.

SUCH is the verdict of America as expressed by her leading newspapers. Such is the answer of the United States to the campaign that has been waged for the past two years to incite hostilities. Such is the real reaction of the country which has been concealed from the people of the Far East by the mass of anti-Japanese correspondence and literature disseminated from Washington by interested parties. "Japan astonished the Americans with her spirit of give and take and a readiness to meet us more than half way on all essential points," says the *New York Herald*, who led the attack upon Japan at the opening of the conference through the articles of Mr. Louis Seibold. The *Herald* goes further and testifies that "Japan has greatly surprised public opinion by the large view she has taken of all matters and by her readiness to co-operate with other nations in the interest of world betterment." In the matter of the *Mutso*, the same paper adds, "Japan had met the other delegates of the conference in so fair a spirit and on so many points that it was amply due her that in the circumstances they should meet her in this matter of profound national objection to the destruction of the *Mutso*." The *New York Herald* has lived up to its grand traditions in so frankly and quickly counteracting editorially the wrong impressions created through its reading columns.

The *Newark Star* gives perhaps the best composite idea of the reaction of the country as a whole on Japan and her policies. It says:

"It was Japan who was expected to throw emery powder into the works of the Washington conference, if any were thrown. It was Japan who was feared as the proposer of jokers, the spinner of intrigue, the smooth and wily trickster—far too clever for American and European diplomatists—who would prove this huge show to be a comedy.

"To date, Japan has been everything it was feared she would not be. Her request for a modification of the Hughes' naval disarmament program involves just one warship. She has not balked or been sullen over the discussions of the Far East questions.

"Just as the Japanese delegates have been eager to accept the principle of the 'open door' so have they committed their government to other policies warranted to prevent friction in the Pacific. Japan at Washington is quite another country than the Japan at Versailles.

"It is doubtless true that Japan is forced into a position of fair-dealing and concession. She cannot pursue an individualistic course in the Far East. She has hoped and worked for the support of Britain as against the United States. Britain elects to do at the Washington conference as America does. Japan promptly swallows disappointment and falls in line.

"But forced to give way or not, Japan has done it gracefully. Unless she reverses her present tactics she will come out of this conference with a rehabilitated reputation among Americans."

The correspondent of the *London Daily Chronicle* says that—

"It must be admitted that so far Japan has had amazing success in this conference. The quadruple treaty speaks for itself. Japan came to Washington with many misgivings. Her chief fear was of isolation, in other words, loss of the English alliance with nothing of much value as a substitute. What she now receives is much wider in scope—a mutual pledge by big Pacific powers that makes the ocean in which the island empire is situated absolutely safe. The agreement not to fortify islands puts the final seal on Japan's security: she may now rest in placid confidence behind an impenetrable strategic shield of from 4,000 to 8,000 miles of navally untraversable ocean."

The *Wheeling (W. Va.) Register*, one of the first American papers to note the change in popular sentiment, said:

"The Japanese bugaboo appears about ready to collapse. It has served well the purpose for which it was created (spurring America on to greater and greater war preparations for the benefit of corpulent armament builders and munition makers), but it is now doomed for the ash can where it has long belonged, and much because of the attitude taken by the Japanese delegates at the disarmament conference."

The position of Japan is also ably outlined by the *Rochester Post Express*, which says:

"That Japan is an intensely ambitious nation cannot be denied. But the Japanese are a people capable of adapting themselves to every change of circumstances. Their demands on China have been abated because they realized that justice necessitated concessions to their Chinese neighbors.

"No longer does Japan insist on her twenty-one demands. She puts generosity above self-interest. China is unprogressive. Japan is progressive. But those who suspected that Japan desires to rob China were utterly wrong.

"The negotiations between these two great nations of the Far East have resulted in an expression of willingness by Japan to transfer the Shantung railway to China on certain equitable terms. With regard to other nations Japan favors the 'open door' in China. She has become the ally of the United States against whom she was supposed to be meditating war.

"If her militarists had an aggressive policy, the true Japan has discarded it, and freely entered into the brotherhood of nations.

"Let us, then, honor Japan as a heroic nation whose chivalry and sense of justice have triumphed over those selfish instincts from which neither men nor nations are free."

Mr. Elmer Davis, special correspondent of the *New York Times*, writes:

"Washington has taken a liking to most of its guests at the conference, even if not all the guests have taken a liking to Washington. Perhaps, if any one of the delegations has made a more favorable impression than the others, the honor would have to be given to the Japanese, whose representatives have been—as Japanese representatives abroad usually are—admirable examplars of the old culture of Japan, living proof that it can be combined with practical modern qualities without suffering deterioration."

The *Philadelphia Record* supplements the above as follows:

"Japan balks at restoring Port Arthur to China, and if Hongkong is left with England, Japan might keep the position which it has captured twice, the second time from Russia at a cost of 22,000 men. Japanese interest in this place is not wholly sentimental. China is not strong enough to hold the point, and an enemy at Port Arthur would be a great danger to Japan. We probably know now why Japan insisted on 70 instead of 60 per cent. of capital ships. It can recede from that position in consideration of being allowed to keep Port Arthur. *If China can get back Weihaiwei, Tsingtao and Kwangchow without cost and without an effort it will be a sufficient triumph for Oriental diplomacy.*"

Without a dissenting voice British journalists at the conference bear willing testimony to the brilliant success of Japan. At no point has she been open to the criticism of playing a double game. To sum up, the re-action of sober-minded America on Japan as opposed to the professional jingoes and trouble breeders, is best set forth in the following eulogy appearing in the January number of *World's Work*:—

"The Japanese delegates at the conference have been a delight to the well-wishers of Japan. They have dropped the reticence which made the Japanese at Paris almost unintelligible to the Western understanding. Now that they have spoken freely, their conversation reveals them in an unexpectedly pleasant light. They talk the language of the West, and, better yet, they talk the language of Western liberalism. No mere facility in the use of the catch-words of democracy could for weeks on end conceal an ignorance of the realities of the subject matter. These Japanese have really grasped the philosophy of Western ideals as we know them.

"Their presence here as the plenipotentiaries of Japan is profoundly significant. Premier Hara doubtless knew his men when he chose them, and Premier Takahashi doubtless knew them when he confirmed their warrant to act for his government. They doubtless represent the sentiment that now controls Japanese policy—and that sentiment is certainly very different from the feelings which controlled the government of Japan four years ago.

"Events in Japan indicate a silent revolution in that country of the most far-reaching importance. The accession of Hirohito to the regency brings to the throne the first ruler of Japan who has traveled in the West and been educated in Western ideas. That accession was apparently timed to be significant at the moment when America, Great Britain and Japan were composing their differences in Asia. It is coincident with studied announcements of the retirement of the two of the three living elder statesmen who represent the ideas of German origin upon which the constitution of Japan was built. Unless evidence that has a striking unanimity of character is pure coincidence, Japan is giving notice to the world of a new tack that will bring her morally into the front rank of modern nations. Apparently she has made the great decision—that she will compete with the world hereafter in a generous rivalry of fair play and in an emulation of the best practices of advanced democracy.

"This is a golden opportunity for America to further the cause of civilization. The way to do it is to meet Japan half-way. Every effort of our government and of our people should be put forth to establish contact with the Japanese government and people, to strengthen the hands of that element in Japan which believes with us in the doctrines of liberalism, peace and concord. Japan's new attitude must pay dividends in Japan, or it will not last. We must co-operate to the end that it shall be so profitable that it cannot be overthrown. Mr. Mark Sullivan, elsewhere in this magazine, has indicated some of the ways in which, even individually, we can improve the opportunity. American capital can likewise help. So can the government. Japan has earned the right to cordial co-operation."

In these words the great magazine owned in part by Mr. Walter H. Page, ex-ambassador to Great Britain and stalwart supporter of Woodrow Wilson, undoes the propaganda so viciously spread by those officials of the past administration who have been foremost in impugning the good faith of Japan in order to distract attention from their own diplomatic shortcomings. It has been clear for the past two years that a great change was taking place in Japan, that her business men, bankers and merchants were more and more dictating the policy of the government, a policy that has for its ultimate goal co-operation and harmony with America and whole-hearted friendship for China. THE FAR EASTERN REVIEW has held steadfast to its faith in the good intentions of this element and supported the campaign for better relations and a peaceful solution to our national misunderstandings. Japan has played the game squarely and fairly. She has met us on all points. She has earned the right to our respect and cordial co-operation. Her friendship is our best asset in the Pacific. The conference has ushered in a new era, which finds us allied to Japan for maintaining the peace of the Pacific, a pact in which she will ungrudgingly carry her full share, irrespective of what it may cost.

China's Victory

JAPAN'S brilliant success at Washington is equalled, if not surpassed, by the great moral victory scored by China. Never before in the history of the world (perhaps never to be witnessed again) has a bankrupt, chaotic and hopelessly disorganized government received such consideration, such courtesy, such assurances of friendship and desire to assist it as did that of China at Washington. The treatment accorded the Chinese stands unparalled in history and the names of Sze, Koo and Wang will be honored for their heroic fight against the most tremendous handicaps ever faced by the plenipotentiaries of any nation. They stood pitted against the strongest diplomats and minds of the day, with nothing behind them but the moral force of their appeal. They represented a government unworthy of the name, one admittedly incompetent to carry out any committments that may have been entered into on its behalf. Their voice carried no weight, no authority; they were beggars before the court of world justice.

The *New York Journal of Commerce* described the situation succinctly when it declared that

"all that can possibly be demanded of the powers by the government of China to-day, is to recognize it as a going concern. To assume its ability to discharge any international responsibilities that might be accepted on its behalf is to predicate for it a length of life to which it cannot aspire. Confessedly, the government of Peking is bankrupt, it has defaulted on its debt payments: it can pay no salaries to those in its employ, and even the expenses of the delegation in Washington are being paid, according to the best information available, out of a fund subscribed by Chinese merchants abroad."

The three official representatives of China not only labored under these tremendous handicaps, but their position and efforts were made more trying, more difficult, by the constant interference of the swarm of unofficial delegates who sought to impose their views upon the conference. "The attempts to disrupt the Chinese delegation and weaken its efforts at the conference have come not from the representatives of other powers who have differed with China's proposals, but from within the delegation itself."

Mr. Junius B. Wood, the able correspondent of the *Chicago Daily News*, tells us that these inside differences arose when united action and harmony were most needed in the difficult negotiations. Even Dr. Tsao, who resigned as chief secretary of the Chinese Delegation because he felt that China was not receiving a square deal, had his ire aroused at the anonymous interviews given out by "unofficial delegates" questioning the consistency of the policy which Secretary Hughes had followed in regard to China.

"As long as the three delegates are here representing our government," said Dr. Tsao, "they alone can express the policies of the delegation or have the right to comment on the work of the conference. If one of several of our advisers or secretaries quit, that is purely a private affair of our delegation. Mr. Briand, who was the chairman of the French delegation, went home, but that did not change the status of the delegation in the conference. A changing of advisers certainly cannot do so. That is happening with regularity in all the delegations.

"That these advisers should criticize the work of their delegates or of other persons in the conference is both premature and in bad taste. At the most it is not entitled to any more weight than an expression of their personal opinions, not an official opinion of China, which can come only from the three delegates.

"There certainly is no basis for any charge that Mr. Hughes has weakened in his efforts to secure justice for China. No such feeling is entertained by us. We realize that he has done so much for us, and it is too early to express either gratification or disapproval of the final decisions of the conference, which still are a long way off."

"The complaints about the policy of the Chinese delegation and about the treatment it has received from delegates of other countries have not been limited to public interviews," adds Mr. Wood. "Numerous Chinese have called on members of other delegations, pouring out their real or fancied troubles, and creating an impression in many quarters that the delegation itself is cantankerous and inclined not to be satisfied with anything."

The attempts of these so-called people's delegates working with the Chinese students and other organizations in the United States to intimidate the official representatives, together with the untiring propaganda of Dr. Ma Soo, the Canton delegate at Washington, to discredit the Peking government and wash China's dirty linen at the conference, provided Washington and the world an object lesson of the rivalries and disorganization in China's domestic affairs. Chinese publicists, students at colleges, unheard of before the conference as writers or experts on their own problems, deluged the press with copy, all emphasizing that China would not be bound by the terms of the Versailles treaty and that the Shantung question would have to be thrashed out in full conference. Various unofficial programs were presented to the newspapers as the irreducible minimum of China's demands, all intensely patriotic, but all losing sight of the one great fact that China is unable to maintain or guarantee her sovereignty. This divergence of views, lack of organization and program, and squabbling amongst themselves more than anything else, helped to convince the conference that China was as yet in no position to be entrusted with the full management of her own affairs.

China at Washington stood revealed to the world in all her "make believe," striving desperately to "save face" by ignoring facts. It laid her open to such bitter criticism that her people should be convinced of the precarious position they hold in world affairs. In the face of existing conditions her delegates sought to impress upon the conference that China stands upon "the same plane in respect of law and justice as do the most advanced and most intelligent of Western states." Especially was this so in Minister Sze's admirable presentation of China's case and her demands for an immediate release from all impairments and limitations upon the "autonomous, unembarassed exercise of her territorial administrative powers." Which influenced *The Times (London)* to call him to earth in the following terms:—

"The arguments by which the Chinese delegate supported his fresh demands were skilfully adapted to the minds of Western democracies, who fondly believe that a government represented by so plausible a speaker must in all that is essential resemble their own. This effort to establish that all his new demands are the inevitable consequences of principles which the committee have adopted, and that the members cannot reject them without stultifying themselves, was framed and pressed with an adroit perception of popular ignorance and of popular sentimentality that does him infinite credit, and the way in which he introduced the question of Manchuria is dexterous. But the part of his speech in which he surpassed himself was in his grave appeal to his colleagues on the commission to reflect what their feelings would be were encroachments like those of which he complained made upon the sovereignty of their own countries." "Your feelings of justice and your sense of the dignity due to your State," he told the representatives of the United States, of England and of Japan, "would in such a contingency make evident the propriety of a claim such as China now advances. The rights of exclusive territorial jurisdiction, in international law and in the general sense of international comity and justice, manifestly attach to the status of sovereignty and independence. Yet these rights are being infringed in the case of China. Nothing could be more plausible, and nothing, as many of Mr. Sze's hearers knew, and as he knew they knew, could be more hollow and more misleading. We have seen the strength of Chinese statecraft; here is its weakness. It has an implicit faith in the virtues of "make see," and accordingly the Chinese delegate claims to the representatives of the Pacific powers, well acquainted with the truth, that China stands upon the same plane in respect of law and justice as do the most advanced and most intelligent of Western states. The ingenuousness with which he assumes that an imposture so palpable can pass muster is almost touching—especially when he hnows that not all the artifices and obstruction of his government can prevent the proposed commission of enquiry from letting in the harsh light of day upon the fiction."

After a scathing criticism of Japan's former policy in China and recognizing the change that has taken place as the result of a new outlook on the future of the empire, the *Birmingham (England) Post* scores China in the following words:—

"The real obstacle to a harmonious settlement is one not foreseen by most people —the attitude of China, one absolutely inconsistent with existing facts and with any possible settlement. China came to the conference as an injured party, wronged by Japan. She is there now, in opposition to Britain if not to America, claiming the consideration and aid needed by a weak nation and the rights and privileges of a strong one. Unless she can be persuaded to change her position, it seems to us impossible for the conference powers to assist her. In that case she will go on to disaster and partition—partition by her own warring elements if not by outsiders. If that catastrophe should occur, then Japan may conceivably revent to her old policy. But to-day she is, we believe, desirous to follow the new one. And so, despite Mr. Koo and his preposterous assumptions and claims, the situation is still not beyond hope."

This is taken up by the *South Wales (Cardiff) News*, who calls attention to the notorious weakness and corruption of the Peking government, the inability of the people to maintain their national independence and the handing over of the country to the freebooting tuchuns which show

"that the Chinese representatives at Washington have a dubious status. They may speak for the Peking government, but it does not appear that the Canton government, or the general body of provincial governors, recognize them. They show also that even with the goodwill of the great powers it is a very moot point whether China is capable of governing herself. And a country in such a chronic state of weakness and disorder tends to become a prey to stronger powers, even though such powers may not desire to interfere in its affairs. We have to recognize the plain teaching of history, that as many wars have been caused by weakness as by strength. A government that cannot maintain law and order, and is acknowledged in only a small part of the territory over which it is supposed to rule, is a standing menace to itself, and a target for all its neighbors. This is the present condition of China, and were it to continue it would be extremely difficult for Japan and other powers to adopt the rôle of disinterested spectators."

In regard to Minister Sze's demands for the withdrawal of foreign troops from Chinese soil and the abolition of any and all impairments of China's sovereignty, the *Sussex Daily News (Brighton, England)* says:

"Acceptance of this demand would, of course, render any discussion of a Chinese settlement entirely superfluous; it would simply mean handing over the whole matter to China to decide. Whatever may be said of the abstract justice of such a course, it is clearly not a practical proposition. It would hardly be practicable even if China were a united and well governed country, and her delegates could claim to speak in the name of it. As things are, it is little short of preposterous. We trust that this resolution will promptly be dropped, and that the Chinese delegates will descend to the mundane plane of those realities which it is the business of the conference to discuss and, if possible, to adjust."

CHINA'S STANDARD BEARERS AT WASHINGTON

Alfred Sze

Wang Chung-hui

Wellington Koo

Lt.-Col. Repington, the military correspondent of *The Times*, lost his temper when it appeared that the Chinese delegates might resign or bolt the conference and sent the following dispatch to his paper :—

"There is much talk of dissensions in the Chinese delegation and of the departure of some or all of the delegates from Washington. The world will not come to an end if they go nor will the work of this conference be deflected from its course, but it would be well for the Chinese to understand that they can only get what they want or are said to want by their supposed representatives when they re-establish order and create the services needed for an efficient administration. It will be only of disservice to China if the powers represented here leave China with confusion worse confounded."

The Morning Post (*London*) also scores the Chinese for their attempt to convert the conference into a clearing house for domestic politics and says :

"The difficulty of dealing with the Chinese has again been demonstrated. Four of the most prominent advisers of the Chinese delegation have resigned and refused to have any further association with the conference. They give as a reason that their delegates are sacrificing the interests of China, and that Great Britain and the United States, instead of standing out for the protection of China against Japanese rapacity, have yielded everything to Japan and will leave her more strongly entrenched than ever. These are the assigned reasons, but the real reason, it is believed, is the struggle for supremacy between the so-called governments of the North and the South, and Washington is being made an arena of Cantonese and Pekingese intrigue.

"The attitude of China is so unreasonable that she is rapidly losing all sympathy. There is a genuine desire on the part of all the powers to help China. Japan, from all accounts, has been reasonable and conciliatory, but China asks impossibilities and her pretensions are absurd. China has been given a golden opportunity at this conference and she does not recognize it."

It remained for the *New York Herald* to read the Chinese a friendly lesson as to American ideas on her welfare, and clinch the many criticisms of other prominent newspapers in England and the United States. The *Herald* places the facts fairly before China in the following terms :—

"Not once or twice but many times this country has gone out of its way, far out of its way, in behalf of the interests of China. America is still the stanch friend of China. China is at the conference because of the insistence of America. America desires for China, and is diligent in seeking for China, the best and the most that can be achieved for her. But now, as for a long time, there are realities which must be faced by China, by America and by the world in working out the problem of China.

"China wants control of her own transportation lines. She should have it when and where it is possible. She wants an end of exterritorial jurisdiction. Everybody hopes she will get it. She wants no international financial control. That were scarcely possible without her consent and voluntary co-operation. All the world as well as China herself wants to see her borders replaced where they belong and where they will no longer offer a temptation to swashbuckling imperialism.

"But who is going to achieve this emancipation for China ? She admits, and her history shows, she cannot do it for herself. No one power, no two powers and no segregated groups of opposing powers can strike from her hands at one stroke the ties that bind her politically and economically.

"China cannot control her transportation lines unless she finds a way to build them for herself. She cannot build them for herself unless she has the aid of outside capital, and this she cannot get while there is danger that the capital might not be repaid or that the railroad might pass into control of some foreign power.

"China cannot abolish exterritorial jurisdiction until she has courts of her own capable of trying cases which involve foreign nationals. She cannot, to any good purpose, set up those courts until an agreement has been reached among the nations formerly enjoying exterritorial rights that they will abide by the decisions of the new tribunals.

"China wants no international financial control ; she can escape it only by throwing off the old indifference as to how, by whom and for what purpose money shall be lent to her. She has been financed in geographical sections until there is neither head nor tail to her fiscal system."

"If a conference in a foreign land were to discuss what was to be done about American courts, American railways and American finance we should of course regard it as insufferable, even if we were invited to send delegates. But in China's case no issue of propriety can be raised. She is, as she should be, represented at the Washington conference because the United States demanded that she should be represented there. China has more to say in this discussion than she has ever had to say in the private negotiations and international intrigues concerning her in the past.

"All this will be considered by China and by the world as the conference tries to work out the solution of her problems."

It is with deep regret that Americans and British editors have been compelled to read the riot act to China who came into the conference of armed nations only because the United States willed it, so that her case might be aired and the causes of international strife removed. The conference was not a court for the trial of Japan. It was an effort on the part of the United States to find some way whereby the Anglo-Japanese alliance could be superseded by some workable instrument that would bring peace to the Pacific and in time stability to China. At all times China was the recipient of favors, and was, through American support placed in a strong position, brought face to face with all the nations interested in the Far East, with their representatives disposed to do everything possible to aid in restoring China's integrity and rehabilitate her finances. China unaided could never have brought about such a conference, and without the moral support of the United States could not have achieved what she did.

For the Chinese to even hint that they might bolt the conference, meant that it would throw upon the United States the task of acting as trustee for their affairs, placing us in a most embarassing position *vis-à-vis* the other powers. The attempt to override the Versailles Treaty relying upon America to stand by them, reflected little credit on the intelligence of those who demanded its reconsideration at the conference. The attempt to hold Japan up as a militarist nation, despite the many great concessions she was prepared to make to regain China's friendship, when persent day China is in the hands of the worst crew of freebooting militarists that has disgraced the pages of modern history, leaves a bad taste in the mouth. Japan's militarists exercised no influence on the conduct of their delegation at the conference. They, at least, have guided Japan to the front rank of world powers, while the militarists of China have deprived the country of its good name, its credit and standing, exposed it to the ridicule of the entire world, a suppliant for justice.

All honor then to Sze Chao-chi, of Cornell, to Koo Vi-kyuin of Colombia and Wang Chung-hui of Yale who stood alone reflecting the highest American and Western ideals of justice on behalf of a people whose rulers had no claim to a seat at a conference of the powers. They scored a success, a victory that their countrymen should be proud to honor them for. It is necessary to emphasize this, for already the vanguard of the disappointed ones are returning to China spreading the story that China has been betrayed, that the delegation has failed, that once more China has been humiliated and Japan lifted up to prominence.

If any defeat is to be registered, it is not China's official delegates who must stand the blame. The onus of failure must be borne by those responsible for China's defeat at Paris, those advisers and others, who enticed her to the highest pinnacle of hope only to dash her over the precipice and hurried home to justify their action by clamoring for war with Japan. The only failure registered at the Washington conference was on the part of those who persisted in concentrating their fire upon Japan, striving to discredit, isolate and drag her to trial before the court of world opinion. They failed. China and the world will do well to forget them. If the results of the Washington conference are to bring strength and stability to China, she must face the future with a new outlook. She must accept Japan as a friend, for only in this way can the other partners of Japan be of assistance to her. China refused to heed the lesson of the consortium in that Japan and America were the only two nations that had the money to lend her for reconstruction purposes. Unless there was the most complete accord and harmony between Japan and the United States, China could hope for no outside financial assistance. What held good two years ago, holds good to-day. The American people are tired of this incessant nagging of Japan. They want to be friendly with her, co-operate with her and together with the other consortium powers, lead China along the path of true greatness and prosperity.

China's false friends, have had their day. Unless we are very much mistaken their usefullness is finished. Their further employment by China to continue an agitation that has been frowned upon by the best element in the United States will be the one thing that will prevent her from enjoying the fruits of the conference. China has a brilliant future ahead of her. All her friends, stand ready to help to push her along. China will be well advised to turn a deaf ear to those who preach that she has been defeated, and remain well content with the brilliant victory of Sze, Koo and Wang until such time as she gets once more on her feet, and can, with propriety establish her claims to further concessions.

Odagiri Defends Lamont

AS disclosed in the January Number of THE FAR EASTERN REVIEW, the attempt on the part of Mr. Lennox Simpson to impugn the integrity of J. P. Morgan & Company in the matter of the German Hukwang bonds held in America, and through this firm, the consortium as a whole, was immediately resented by Mr. Thomas W. Lamont, who not only clearly stated the facts in regard to the possession of these bonds but found occasion to pay his compliments to the pernicious activities of those who would create suspicion and stir up trouble between Japan and America. In view of this and other efforts on the part of China's advocates to discredit the consortium, Mr. Mannosuke Odagiri (representative of the Japanese banking group in the consortium), in Washington as the financial adviser to the Japanese delegation came to the support of Mr. Lamont in a public statement issued to the press on December 18.

Mr. Odagiri upheld the attitude of Mr. Lamont in insisting that China should pay interest upon the Hukwang bonds of German issue which had come into the possession of Americans.

Mr. Odagiri denied the statement recently made by "Putman Weale," the effect of which was that China had repudiated the German issue of the Hukwang bonds at once upon the declaration of war against Germany. Mr. Odagiri said that no such repudiation was made until some time after war was declared and that therefore these bonds might naturally and properly come into the hands of Americans inasmuch as the repudiation was not announced with the declaration of war. Mr. Odagiri thought it was proper that the American holders of the Hukwang bonds should be paid, as contended by Mr. Lamont.

Mr. Odagiri said he was influenced in making his statement because of the controversy which had been under way between Mr. Lamont and Mr. Simpson.

Object of the Consortium

"The present consortium, as Mr. Lamont has recently written," said Mr. Odagiri, "was formed at the instance of the governments of the United States, Great Britain, France and Japan, with a view to ending competition in the furnishing of public funds to China. The object of creating friendly co-operation among the bankers of these countries was with the hope that this action would contribute to the restoration of a healthier and more stable economic and financial condition in China. When these four countries saw that China was in serious financial difficulties, they got together in an effort to help her avoid what might become a calamity. Other nations have been wrecked by unlimited borrowing and it was desired to save China from such a fate.

"Under existing international handicaps, the Chinese government has been unable up to the present to extricate the country from its difficulties. Some of the government officials have not exemplified the traditions of honesty which made the Chinese merchants of the nineteenth century notable in their dealings with foreigners. The record of Chinese credit, up to recent time, is one of the best examples in history of the highly profitable character of a reputation for honesty, though the integrity of the merchants has not extended fully to the governing classes. The moment it should become clear that money lent in China would be honestly and effectively used, the need for precautions on the part of foreign bankers and foreign governments would disappear.

"No nation alone could furnish the capital for China's gigantic construction and re-organization needs. In the case only of communications the requirement is for billions of dollars. There are approximately only 8,000 miles of railway in China, though her territory is considerably larger than the United States and the population is believed to be four hundred millions. In the United States there are over 270,000 miles of railway.

Must be Absolutely Secure

"Loans of such size as China's needs involve are not made by capitalists. The capitalists only underwrite them for disposal to investors. The bonds cannot be sold successfully unless they are absolutely secure and the income from them is attractive. A prime requisite for such security is a condition of respect for property rights.

"It will be noted that so far the consortium has made no loans to China. A prime rule of the consortium is its purpose to lend money to Chinese governments (central or provincial) for only the larger economic development work of strictly public character, and only on the request of such governments. The consortium refrains strictly from commercial or industrial financing, with which it has nothing whatever to do, and therefore it can hardly be described as exercising a monopolistic control of loans in China.

"The requirement by the consortium of supervision of the receipts and expenditures involved, as security for loans made by it, is strictly in accordance with usual banking practice. It is not for the purpose of securing control of China's finance, but to obtain the customary protection for investors in the loan. They must be assured that the property for whose development their money is borrowed is to receive the maximum benefit from the money, so that the security shall be increased in value and the means for repayment shall be provided. In this case the property requiring development is China, and its managers, the government, should welcome the advice, co-operation and expert book-keeping which the bankers offer for the benefit and protection of both the management and the bondholders. Without such protection it will be impossible for China to borrow large sums of money.

Welcomed Chinese Group

"The organization of the Chinese banking consortium, which was formed last year, was welcomed by the international consortium, and it is to be remarked that this association of Chinese bankers has adopted in practice exactly the same attitude in lending money as that of the foreign group, namely, it has demanded from the Chinese government satisfactory assurance that the money borrowed shall be spent for the purpose for which it is lent and not applied indiscriminately to 'administrative' purposes, for current expenses or maintenance of the various needlessly large provincial military establishments. The two groups of bankers, Chinese and foreign, are in accordance as to purpose and method.

"This is particularly interesting because of the latent financial power in China. There is money there and there is adequate banking machinery to provide funds for government financing. But that power has been withheld by the Chinese bankers and business men because they could hitherto get no satisfactory assurance that money lent to the government would be either used legitimately or repaid when it became due.

"It cannot be too strongly emphasized that the consortium does not seek and does not desire that control of China's finance. It cannot gain such control so long as it follows the principles to which it is committed. And it never has interfered and never will interfere with private financing. The consortium seeks only to help in the establishment of China's financial situation on a sound basis—from which the Chinese will be the first and greatest beneficiaries."

Shanghai Harbor Investigation

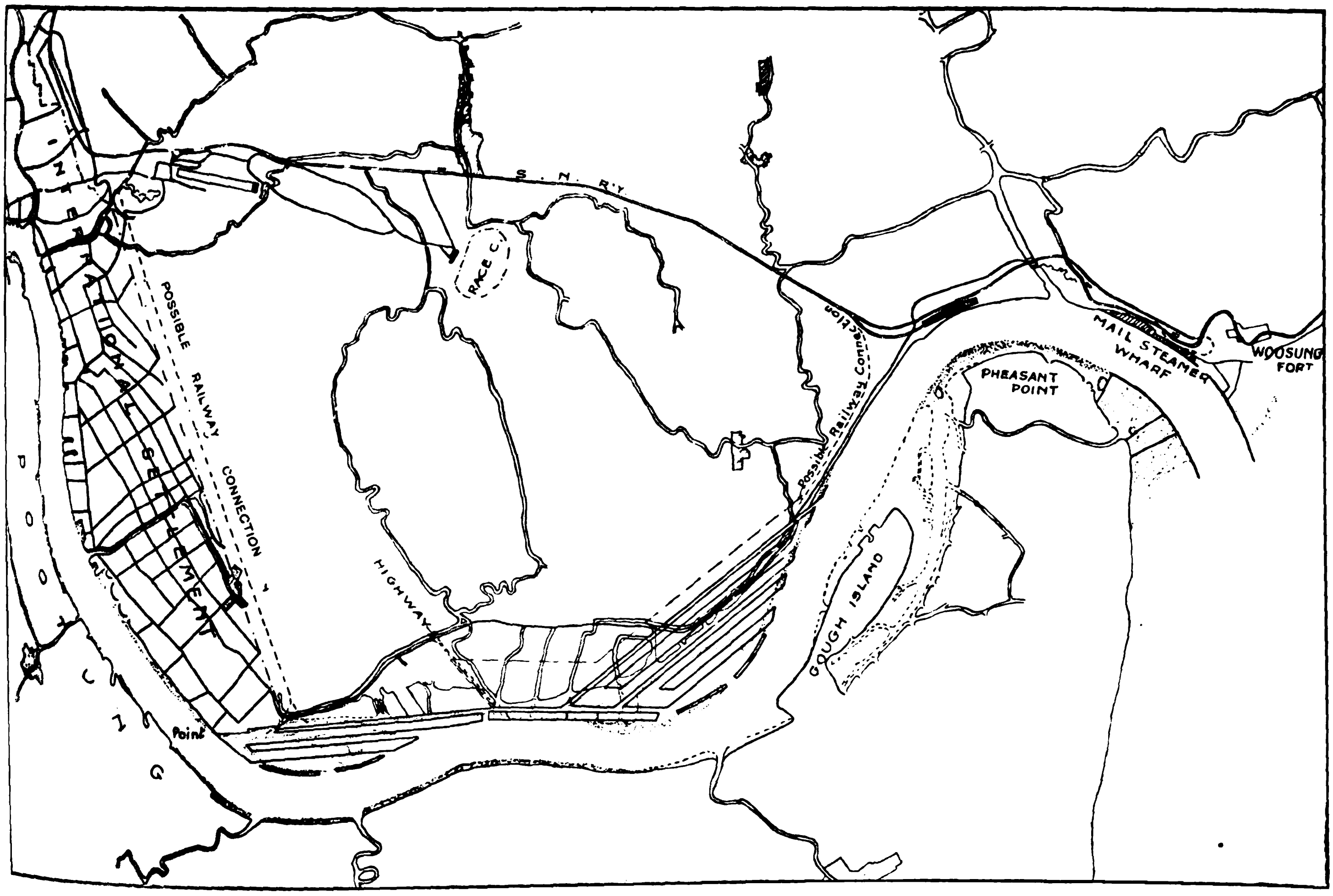
Full Report by the Committee of Consulting Engineers

I. PREAMBLE.

1.—The importance of Shanghai as the commercial gateway of Central China is too well known to need more than the briefest reference in this report. Situated as it is within a few miles of the mouth of the Yangtze River, on the banks of the tributary river Whangpoo and protected by its position against serious danger from typhoons, it is eminently suitable as the distributing port for the commerce of the rich and densely populated basin of that great river, which spreads westward across the whole width of China. In the delta of the Yangtze an area of nearly 50,000 square miles supports a population of over forty million people which is directly dependent on Shanghai, and in the whole watershed of 750,000 square miles the population is one hundred and eighty millions, or more than one-tenth of the inhabitants of the whole world.

2.—In no other part of the world does a population of this volume and density depend for its commercial intercourse upon one main river and one distributing port. For a thousand miles the Yangtze is navigable for river steamers. Hankow, six hundred miles from the sea, is accessible at all times for steamers of 2,000 tons, and during the summer months for vessels up to 8,000 or even 10,000 tons. Throughout the great alluvial plain innumerable waterways form a network extending in all directions, even as far north as Peking, and act as feeders to this mighty waterway for the traffic on which Shanghai is the natural point of distribution.

3.—The gross trade of the port of Shanghai, which in 1920 reached a value of Hk. Tls. 840,000,000, not including tranship-ments declared for other ports, increased during the period 1900-1913 at the rate of Hk. Tls. 20,000,000 per annum. In 1920 the annual increase compared with that at other great ports of the world is found to be normal, and it seems probable that the pre-war rates of increase will continue. It is certainly very conservative to estimate that the increase in bulk of cargo and in tonnage entered in ten years will be at least 33 per cent. Thereafter the increase is likely to be still greater. It has been possible hitherto to accommodate the trade offering itself, but the growth during recent times in the size and draft of ocean steamers brought about by the need for cheaper transport now makes it incumbent on Shanghai to provide in progressive measure for larger vessels as well as for expanding trade. It is essential that the facilities of the port shall keep pace with the requirements of modern transportation. It can be said safely that, given adequate facilities, the potentialities of Shanghai's



KEY PLAN OF THE WHANGPOO

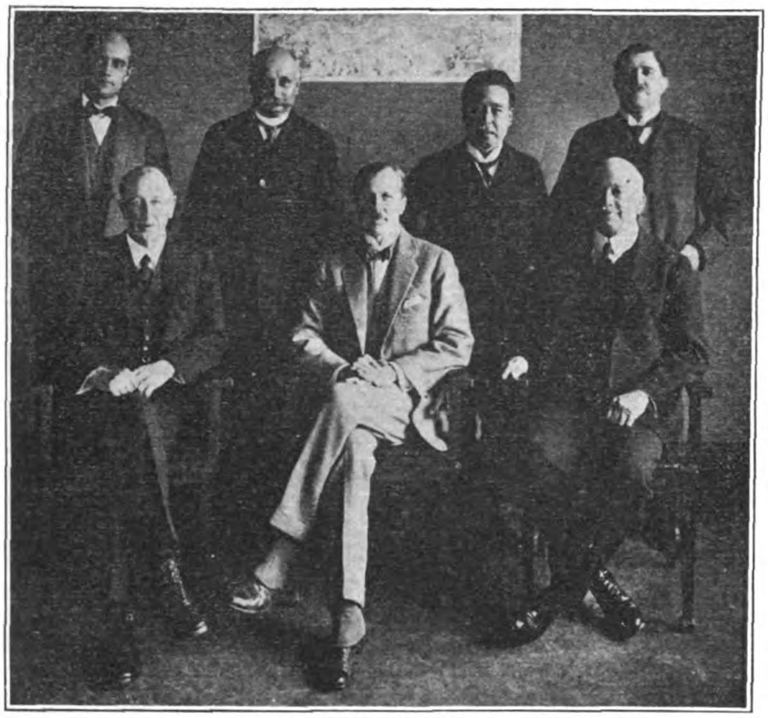
The Plan here shown of Basins forming the Commercial Wharf and Dock Harbor is a mere indication of possible Development of Available Sites Adjacent to Shanghai. The Actual Layout is a matter for detailed study in the future.

Commercial Wharf and Dock Harbor { Berthing Space Proposed for Immediate Construction 2,500 feet; Possible Future Berthing Space . . . . . 57,000 ,, }

Mail Steamer Wharf { Berthing Space Proposed for Immediate Construction 600 ,,; Possible Future Berthing Space . . . . . 6,000 ,, }

enormous and densely populated hinterland, served as it is by probably the most extensive system of waterways in the world, with cheap transportation for both the requirements and the products of the country, afford indisputable indications that the growth of trade will continue.

THE COMMITTEE OF CONSULTING ENGINEERS



FROM LEFT TO RIGHT

First Row (sitting): Maj.-General W. M. Black, Mr. H. von Heidenstam (Chairman) and Mr. F. Palmer

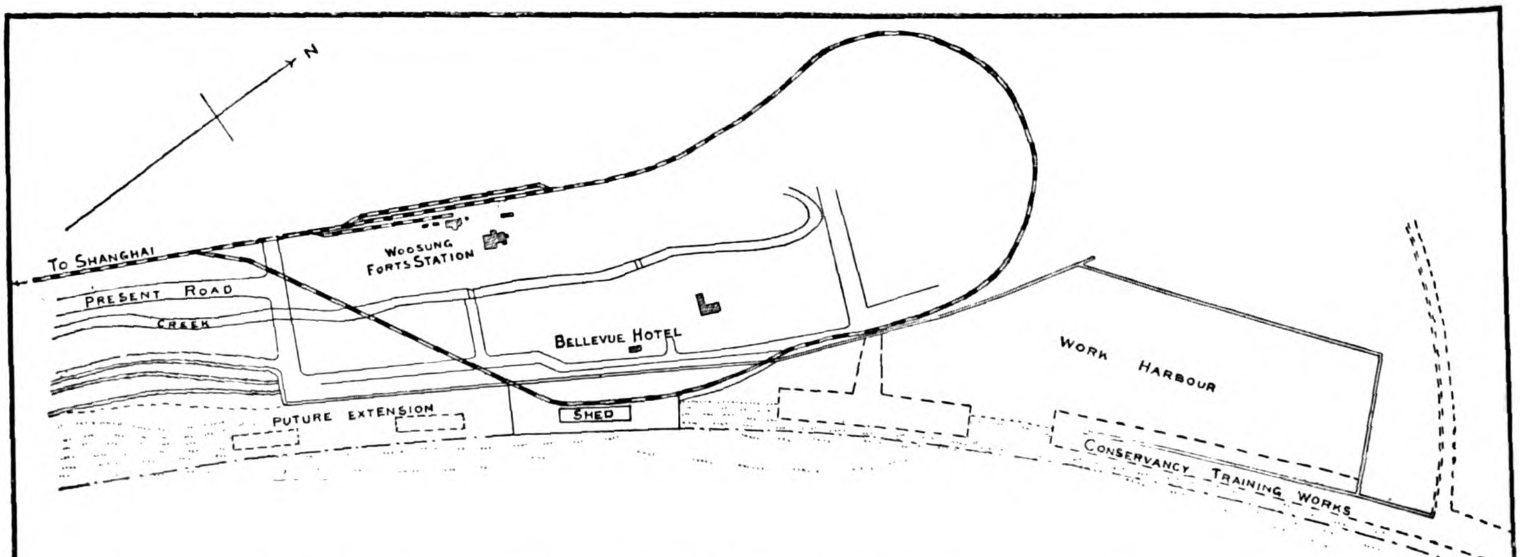
Second Row: Mr. P. G. Hornell, Mons. L. Perrier, Dr. I. Hiroi and Mr. P. Ott de Vries

4.—Up to the present time accommodation in the port has been provided by individual enterprise on the part of the merchants, but, as in all other great ports, development must eventually depend upon collective effort because it is only by this means that improvements in facilities of a general nature, such as the deepening of the approaches, can be brought about. Within the limitations of their powers and of their means the Whangpoo conservancy board have commenced and effected very great improvements in the Whangpoo, but the time has arrived when the approach must be developed as a first-class waterway. Not only must the navigable channels be made to conform to the requirements of modern vessels but many other improvements are equally essential. Additional and deeper wharf frontage, more godowns for the storing of goods, more effective means for the handling and transhipment of cargo, and the extension of the harbor limits to permit of adequate control, are all necessary for the trade of the future and for reducing the cost of dealing with that trade. Whether the existing board are to be given powers to carry out these requirements, or a new board constituted to perform these duties, it is obvious that no time should be lost in creating powers to develop and administer the port as a whole.

5.—The Whangpoo conservancy board have had the Shanghai harbor question under continuous consideration since 1916 and, in addition to their scheme of improving the approaches through the Yangtze, have formulated various projects such as a ship canal to Hangchow Bay, a "*port de vitesse*" on Hangchow Bay, the damming up of the Whangpoo, etc. They have also obtained advice from several consulting engineers on the problems involved. Schemes have also been put forward by outside persons, and, finally, a number of projects have been sketched out and considered by this committee during their session. It is therefore believed that no serious possibility for the solution of the Shanghai harbor question has been overlooked by the committee. It is considered unnecessary to go into these many schemes here or to give all the reasons for and against each one of them. The main proposals hereinafter made are considered manifestly preferable to the other possibilities and no doubt exists in the minds of the committee as to their general suitability. The investigations made show that it is possible to overcome all the deficiencies under which Shanghai now labors, at a cost not incommensurate with the benefits to be obtained. Adequate depths can be secured in the approaches and in the harbor itself as and when required; additional and improved wharf accommodation can be provided and efficiently equipped in small units as it may become necessary; the co-ordination of control can easily be effected without detriment to existing interests; all provided the government will, in the interests of the Chinese people, who in the end will mainly benefit, delegate the necessary powers to a competent body.

6.—For the extension of the harbor accommodation the committee are convinced that while it is necessary to provide for some of the steamers at the mouth of the Whangpoo, it is essential that the new wharfage should be situated as near as possible to the present trade centre and that it is desirable for economical working and control to concentrate this development so far as the available sites permit.

7.—With these ends in view the committee in this report make recommendations covering: (*a*) the outlines of a general scheme for continuous future development, and (*b*) the improvements which can be effected without extraordinary outlay to meet immediate needs.



MAIL STEAMER WHARF PLAN

In arriving at the conclusions they have reached, the committee have given the greatest attention to the necessity for limiting the expenditure proposed within the capacity of the trade of the port to pay for such improvements. It is abundantly clear to them that whatever may be the improvements which must be carried out the cost will have to be borne by the trade. Nothing must be done so to burden the commerce of Shanghai as to prejudice the existence of that trade or to stunt its growth, and it is firmly believed that the committee's recommendations are commercially sound. The slight increase of taxation which has to be imposed to meet the cost will be amply repaid by the increased value of the facilities and the economies which will be effected in transportation and in the handling of the goods carried. Without the improvements aimed at by the works proposed, it is obvious that the trade carried in deep draft ships will gravitate to foreign distributing centres and that Shanghai will become a second-class port with consequent great loss not only to local interests, but also to China as a whole.

II. Draft of Ships.

8.—The committee are of the opinion that the trade of the Pacific will in the future be carried in vessels of greater draft than those at present in use, and that in a few years a draft of 33 feet may be reached in the larger vessels for which accommodation will be required in Shanghai. The committee do not consider it advisable to provide at present for anything beyond this draft. Therefore the committee propose a first improvement in depth to such a degree that within a few years ships of 33 feet draft will be able to enter at neap high tides. The methods proposed will afford a progressive increase of depth. A further increase, if required in the future, can be provided for by extending the operations.

III. Approaches.

(See Drawing No. 1.)

General Scheme.

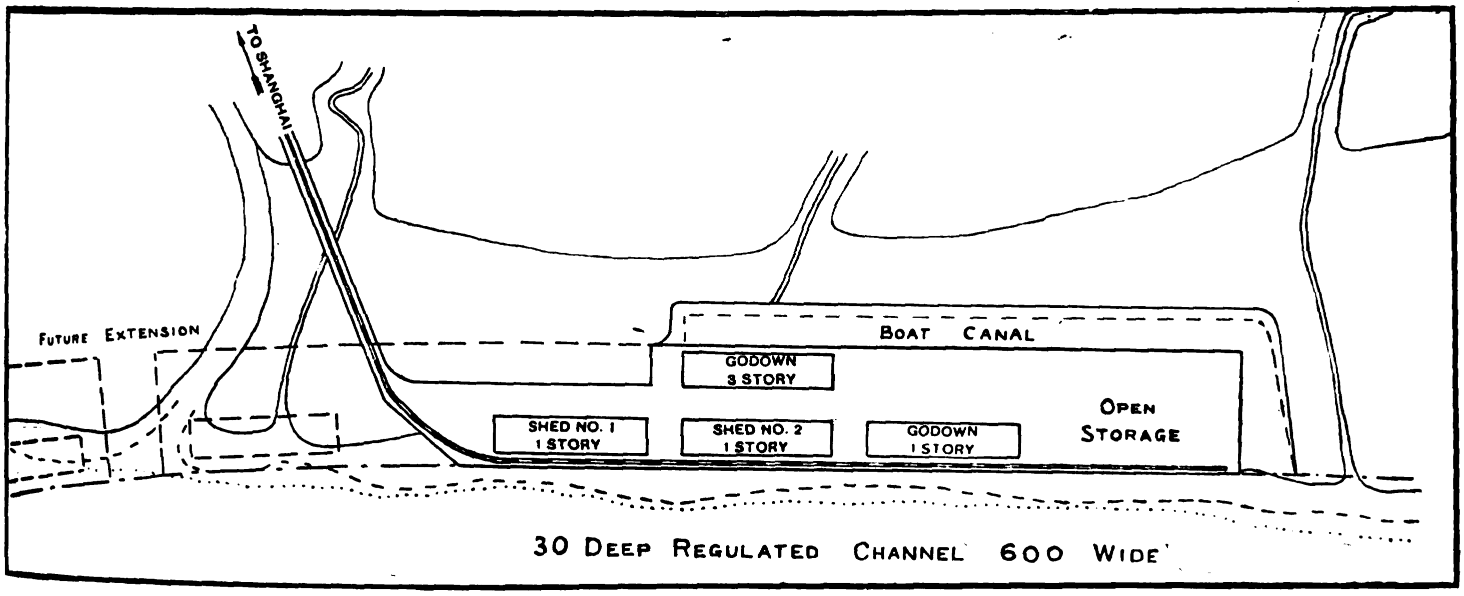
9.—(*a*) *Selection of Approaches:* After consideration of the Yangtze estuary as a whole, the tidal phenomena, the fresh water discharge, the silt-contents, other information available and the reports already made, the committee are convinced that the south channel lends itself most readily to improvement and that the work of obtaining a greater depth should be undertaken along this channel. (*b*) *Regulation:* The committee are of opinion that deepening in the south channel should be undertaken by dredging only, at least in the first instance, and that by this means there is a reasonable prospect of permanent improvement. (*c*) *Observations:* The committee consider that extensive and continuous observations should be carried on in the estuary to provide further information for river engineering purposes, in addition to that available from the navigation charts which may be published from time to time by the Chinese maritime customs.

Immediate Requirements.

10.—The committee recommend that the harbor authority should proceed: (*a*) to carry out forthwith the river engineering observations indicated under 9 (*c*), General Scheme; (*b*) to make and maintain a channel through the fairy flats, developing it gradually foot by foot, to as great a depth and width as required and possible, and to provide as soon as feasible a channel of 600 feet bottom width for the passage of ships drawing 33 feet at ordinary neap high water;

As the mean ordinary neap high water level is 28 feet above the present crest of the fairy flats, and allowances of 3 feet for clearance, wave action, etc., and one foot for the fall of tide during the ship's passage are necessary, this means the attainment of a depth at neap high water of 37 feet or a deepening of 9 feet on the crest.

(*c*) to hire or acquire—whichever is more economical—for the purpose of carrying out this work at least two dredgers of the most powerful type which can be operated on the fairy flats in a depth not exceeding 18 feet; (*d*) to carry out any auxiliary works which may be necessary; and (*e*) to consult the Chinese maritime customs as to the provision of marks and of a first-class depth signalling arrangement at the bar.



COMMERCIAL WHARF AND DOCK PLAN

IV. Harbor.

(See Drawing Nos. 2, 3 and 4.)

General Scheme.

11.—The committee recommend that: (*a*) public quays and moorings be provided; (*b*) a commercial dock, of the open type in the first instance, be provided on the left bank of the Whangpoo, as near Shanghai as practicable and that mail steamer accommodation be arranged, also on the left bank, near the mouth of the river, both works to be designed to admit of further extension as and when required; (*c*) existing foreshore areas and conservancy land be utilized as far as possible for harbor purposes and sufficient adjacent land acquired for future development; (*d*) the Whangpoo regulation be continued to whatever depth may be required and possible to obtain; and that (*e*) cross river communication be by ferries.

Immediate Requirements.

12.—To meet immediate needs, the committee recommend that: (*a*) the engineer-in-chief's "General Work Program" of April, 1921, for the further regulation and maintenance of the Whangpoo be carried out with certain reservations, namely: (1) dredging only should be employed in the first place as a means

of improving the fairway depth to 30 feet at lowest low water; (2) all areas between the old high water lines should be reserved under the board's jurisdiction for potential harbor, industrial and other purposes; (*b*) a wharf 600 feet long be constructed on the left bank near the mouth of the Whangpoo for mail and passenger steamers; (*c*) berthing 2,500 feet in length be provided at once for four or five vessels at suitably equipped riverside wharves with transit sheds, godowns, canal frontage for small craft, and provision for rail connections when required; (*d*) the existing river moorings be acquired and added to as required; (*e*) in the meantime projects be developed for more extensive accommodation in basins, the construction of which should be carried out as and when required; (*f*) as an essential, all the necessary land be acquired at once; and that (*g*) all these immediate and future works should be provided and administered by the harbor authority.

V.—Estimates for Immediate Requirements.

Capital Expenditure.

13.—The immediate measures outlined above have been estimated to involve capital expenditure in connection with plant and construction costs approximately as follows:

Improvement of Approaches:

	Sh. Tls.	Sh. Tls.
Survey Plant:		
Sea-going survey ships, pinnaces, beacons, instruments, etc.	200,000	
Dredging Plant:		
Two powerful dredgers, auxiliary plant, coal barges, tugs, mark buoys, etc.	4,200,000	
Incidental Plant:		
Small tow-boats, work yard and other appurtenances	125,000	
		4,525,000

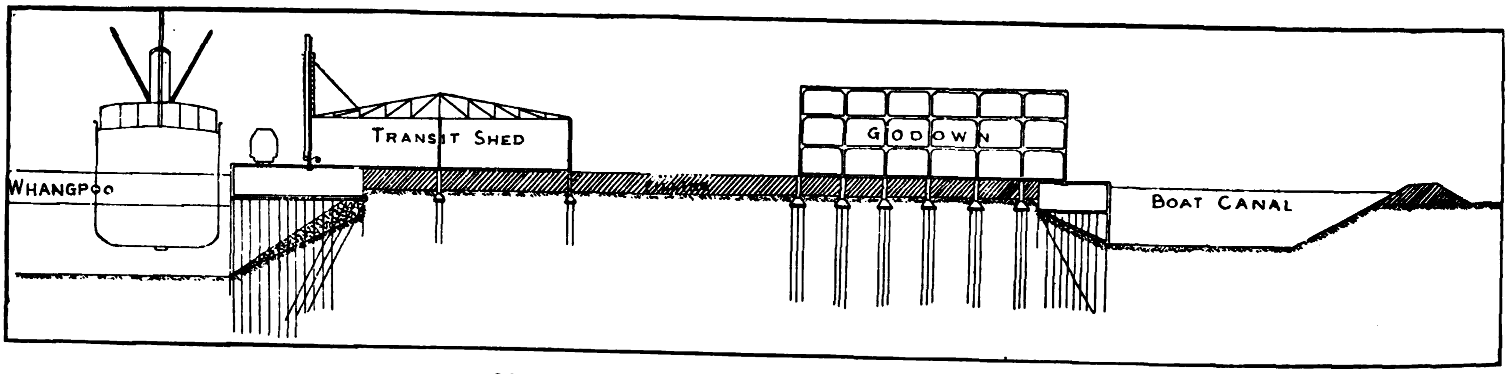
Annual Receipts and Expenditure.

14.—A statement of annual receipts according to the taxation, detailed in Section VI under "Finance," based on 1921 trade figures, together with the estimated revenue from harbor utilities and of estimated expenditures is given below in the form of a working account:

EXPENDITURE.

	Sh. Tls.	Sh. Tls.
General Expenses:		
Improvement of Approach—		
Survey	100,000	
Dredging	1,000,000	
		1,100,000
Harbor Expenses:		
Whangpoo Regulation	531,000	
Commercial Wharf and Dock (2,500 lin ft.)		
Dredging	25,000	
General maintenance	12,000	
Working costs	120,000	
Mail Steamer Wharf (600 lin ft.)		
Dredging	4,000	
General maintenance	2,000	
Working costs	16,000	
Moorings—		
Maintenance	9,500	
Working costs	2,000	
		721,500
Interest Charges—		
Port Debentures 11,020,000 @ 8%	881,600	
Sinking Fund @ 1½%	165,300	
		1,046,900
Balance, surplus		4,100
Total Expenditure...		2,872,500

Note.—The present annual expenditure will gradually increase as further duties are undertaken and capital works are carried out, until, at the completion of the "Immediate" program, the figures of expenditure shown in this statement may be reached.



COMMERCIAL WHARF AND DOCK SECTION

Harbor Work:

Plant for Whangpoo Regulation	725,000	
Commercial Wharf and Dock:		
2,500 lin. feet of public wharf		
3 transit sheds, 120′ by 500′		
Godown, 3-story (120′ by 500′).		
Open storage, 360,000 sq. ft.		
Lighter and native craft accommodation 100′ by 1,800′		
Appurtenant terminal works, such as railway, roadway, paving, mechanical equipment, lighting, etc.		
Total cost including interest during 3 years' construction period	4,500,000	
The capacity of the wharf as outlined above is 500,000 tons per annum, but in estimating revenue a wharf capacity of 350,000 tons only has been taken.		
Mail Steamer Wharf		
600 lin. feet of wharf.		
Transit shed 50′ by 250′		
Appurtenant rail, roadways, paving, lighting, etc.		
Cost with accrued interest during construction period	620,000	
The capacity of the mail wharf is at least 200 berthings per annum, but in estimating revenue only 100 berthings per annum have been allowed for and a tonnage of 80,000.		
Purchase of 19 Moorings	380,000	
		6,225,000
Total Capital Cost... ...		Sh. Tls. 10,750,000

REVENUE.

	Sh. Tls.	Sh. Tls.
General Income:		
Conservancy tax (net) 6 per cent. on customs duty (approx. 0.3 per cent. *ad valorem*) ...	1,610,000	
Transhipment tax at 0.15 per cent. *ad valorem*...	150,000	
Tonnage dues	370,000	
Permits for work, say	3,500	
Shengko receipts, say	26,500	
		2,160,000
Harbor Earnings:		
Commercial Wharf and Dock (2,500 lin ft.)		
Cargo	350,000	
Berthing	75,000	
Godown storage	180,000	
Mail Steamer Wharf (600 lin ft.)		
Cargo	60,000	
Passengers	10,000	
Berthing	9,000	
Moorings	28,500	
		712,500
Total Income ...		2,872,500

Note.—The revenue, based on 1921 figures, given in this statement will be greater from year to year owing to the constantly increasing value of trade. The conservancy tax at present contemplated is only 6 per cent. while the powers proposed allow of 10 per cent. on the customs duty, so that not only will the surplus be greater than shown but there is also a reserve of taxation amounting to over 1,000,000 taels per annum. In the same way, the transhipment tax estimate is only 60 per cent. of the amount authorized.

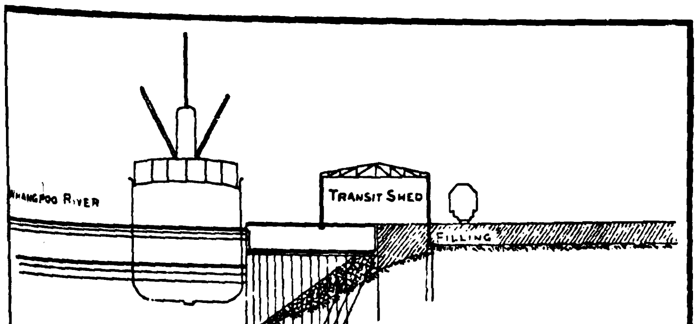
15.—The following table shows against the capital requirements the program by which the funds may be raised by means of port debentures:—

Funds to be Raised.	Sh. Tls.	Sh. Tls.	Capital Requirements.	Sh. Tls.	Sh. Tls.
Port Debentures:			Approaches:		
1st Year ...	2,050,000		Survey plant ...	200,000	
			Dredging plant....	4,200,000	
2nd „ ...	4,100,000		Miscellaneous expenditures ...	125,000	
3rd „ ...	4,870.000				4,525,000
		11,020,000			
			Harbor:		
			Plant for Whangpoo regulation	725,000	
			Commercial wharf and dock ...	4,470,000	
			Mail steamer wharf ...	650,000	
			Moorings ...	380,000	
					6,225,000
					10,750 000
			Flotation expenses ...		270,000
		11,020,000			11,020,000

In regard to capital requirements the table above relates only to works still to be provided. The new board would, however, take over tangible assets in plant, property and cash to the value of over Tls. 1,000,000 and in addition the works executed in deepening and improving the Whangpoo River which are estimated to have cost Tls. 10,000,000 excluding maintenance. Therefore a capital reserve of over Tls. 11,000,000 stands to the present credit of the Whangpoo conservancy board.

VI. Administration and Organization.

16.—The further general port development required at Shanghai cannot be made within the scope of the powers now vested in the Whangpoo conservancy board. The realization of the essential parts of the committee's recommendation will therefore depend upon putting into effect an administrative scheme, providing an executive organization having the necessary authority and with power to raise funds.



Mail Steamer Wharf Section

17.—The formal reference of this question to the committee requires a definite reply, and after careful consideration of the local conditions in comparison with those of the many other ports of the world with which the various members have been associated, the committee are of opinion that the requirements can be met only by the revision of the existing Whangpoo conservancy agreement of 1912 and the expansion of the present board into a new body, which might be known as the Shanghai harbor board, with more extended powers and more directly representing shipping and trade interests. It has been proved beyond doubt that port growth and efficiency are best developed where the governing body includes representatives of shipping and trade interests as well as government officials.

18.—The technical schemes recommended by this committee are of two classes:

non-revenue producing, *e.g.*, the improvement of the approach and of the channel of the Whangpoo;

revenue producing, *e.g.*, harbor utilities such as public wharves, moorings, etc.

19.—The committee have carefully considered all the sources of revenue and consider that while the operations under the second class may be reasonably expected to be self-supporting, it will be necessary to exploit other sources of revenue to pay for the services required under the first heading.

The conservancy tax, at present three per cent. of the customs duties, is no more than one-eighth of one per cent. on the actual value of the trade. To raise this taxation even to one-half of one per cent. *ad valorem* would be an increase quite insignificant as compared with the every-day fluctuations in business conditions, such as cost, freight or exchange.

Cargo transhipped in Shanghai, but declared for other ports, contributes nothing at present to the revenues of the port, the only charge upon it being the tonnage dues imposed for general coast lighting and other aids to navigation. There would be no hardship in imposing a transhipment tax on this transhipped cargo not exceeding one-half of that on cargo passing through the customs. Some difficulties might occur in levying it, but by the imposition of bulk rates these may be overcome.

As to tonnage dues, there are several precedents in China for an additional due being collected for harbor or conservancy purposes.

The committee gave considerable study to the subject of wharfage dues on cargo as now levied by the various municipal bodies, in addition to the regular municipal taxation and rates on riparian properties, and came to the conclusion that merchants and shippers are already charged in this respect to an extent which does not warrant any further increase.

20.—The committee have formulated their recommendations on administration and organization under six headings: Constitution — Jurisdiction — Powers — Duries — Finance — General, in such a form that they may be embodied in a new scheme for the management of the port, as outlined on the following pages:—

Constitution

21.—(1) The board shall consist of: (*a*) Chinese officials, including local representatives of the customs and railways, appointed by the government, one of whom shall be chairman; (*b*) representatives of shipping and trade in Shanghai elected by local interests and also to a limited extent representatives of municipalities; (*c*) a general manager, appointed by the board, who shall be, *ex-officio*, vice-chairman. (2) The members under "(*a*)" shall hold office as long as they fill the positions by virtue of which they sit on the board.

When the board are first organized the term of office of one-half of the elected members shall be one year only, the selection to be determined by themselves, and one-half two years; thereafter the term of office shall be two years. (3) The several members of the board have, as such, equal authority, and the opinion of the majority is to be determinative. In all meetings of the board, if votes are equally divided, the chairman shall have a casting vote. A majority of the whole number of members shall form a quorum.

Jurisdiction.

22.—(1) The general jurisdiction of the board shall extend: (*a*) in the Whangpoo, from its junction with the Yangtze to the tidal limit and laterally between the high water lines of ordinary spring tides. Highwater of ordinary spring tides is defined as twelve and one-half feet above Woosung datum. Within these limits no operation which in the opinion of the board may affect the regimen or navigability of the river shall be undertaken without the board's consent, nor without such consent shall wharves, jetties, pontoons, hulks, etc., be established: (*b*) in the approaches,

from Saddle Islands to Plover Point (the 121st meridian east of Greenwich), in so far as concerns the work of hydrographic survey and the improvement and maintenance of the approach channel: (c) over such areas as may be acquired for harbor purposes. (2) The harbor shall consist of the Whangpoo River, fiom a line drawn square to the river from the upper side of the entrance of the Yang Shih Chiao Creek above Lunghua, down to the mouth of the river, including all public wharves and areas devoted tc public purposes and provided by the board, and also of the Woosung anchorage in the Yangtze River.

Powers.

23.—(1) The authority vested in the board is delegated to it by the Chinese government, and the board are in no way subordinate to the provincial authorities. (2) The board are empowerd: (a) to deal with and improve the navigation and harbor facilities of the port and its approaches; (b) to acquire land necessary for harbor purposes and also to acquire private harbor utilities, by agreement or by expropriation. If the method of expropriation be used, the price shall be submitted to arbitration (c): to construct all public harbor works and provide other public harbor facilities as needed; (d) to operate and administer public harbor works and utilities so provided. The board shall undertake watch and ward within the limits of all areas so occupied and used; (e) in co-operation with the maritime customs to frame harbor regulations, not affecting the proper authority of the customs; all these regulations to be enforced as heretofore by the maritime customs. The control of river police, of sanitary arrangements, of aids to navigation and of pilotage, remain as heretofore in the hands of the maritime customs; and (f) to receive and expend funds for the above purposes and to borrow money for the same. (3) The provision of the scheme for the administration of the Whangpoo conservancy, agreed to April 4, 1912, relating to the sale of crown lands, including the supplementary article agreed to January 19, 1916, shall remain in force and the privileges and powers then granted shall be transferred to the harbor board. Sub-section 9 to the above article shall be amplified as follows:

In the case of Chinese deeds purporting to include an area outside the high water line as it existed in 1906, the shengko area shall be reduced by such title deed area in cases where the title deed was issued prior to 1906. This deduction shall not, however, apply to any area under the general jurisdiction of any government or provincial department over such foreshores prior to 1906.

Duties.

24.—(1) It shall be the duty of the board: (a) to provide a navigable channel in the outer approaches and in the Whangpoo, of width and depth sufficient for the needs of the port; (b) to provide, increase and maintain harbor accommodation, utilities and improvements, as may be needed; (c) to operate and administrate all utilities and facilities provided; (d) to formulate from time to time projects with estimates of costs for works to be undertaken; (e) to maintain the existing and future works and improvements in effective condition; (f) to co-operate at their discretion in the improvement of private harbor facilities, charging reasonable rates for services rendered; (g) to receive and consider applications for permits for private works, and to supervise the execution of such works as may be authorized; (h) to prepare in advance a budget dealing with both capital and revenue for the forthcoming year; and (i) to publish a report annually of all operations of the board together with full statements of receipts and expenditures.

Finance.

25.—(1) The board shall have entire charge of the finance connected with harbor matters. In this connection: (a) they shall receive and take charge of all the funds, properties, assets and obligations of the Whangpoo conservancy board; (b) they shall receive all taxes, dues, grants and revenue from other sources, as specified under Clause 2; (c) they shall disburse the funds required for their administration and executive work at their discretion, taking all customary measures for the safeguarding of their funds, including the requirement of security by disbursing officials; (d) proper accounts shall be kept and audited at regular intervals; (e) in case of taking up loans the board shall inaugurate a sinking fund to redeem the loan in a period not exceeding 30 years in the case of works and 60 years in the case of lands. (2) The board shall be empowered to cause to be levied the following taxes at rates to be fixed annually, and advertised six months before they come into effect: (a) a conservancy tax of not exceeding ten per cent. of the gross customs duties and in the case of duty free goods not more than one-half of one per cent. *ad valorem*; (b) a transhipment tax on cargo directly transhipped to other ports, and not paying customs dues in Shanghai, of not more than one-fourth of one per cent. *ad valorem*; and (c) a tonnage due of not more than ten candareens per net registered ton of shipping using the harbor, imposed according to the present system of levying tonnage dues for general coast lighting and aids to navigation. (3) These taxes shall be collected by the Shanghai commissioner of customs and shall periodically on fixed dates be paid to the harbor board's account. (4) The board shall frame from time to time a scale of charges for the use of facilities provided, and for services rendered.

General.

26.—(1) The board shall, at their discretion, appoint, control and discharge the staff. (2) For all contracts in connection with the works and, under such regulations as the board may determine, for the purchase of material or machinery, for the leasing of public utilities and for the disposal of old plant and stores, etc., public tenders shall be invited and the tender offering the most advantageous conditions shall be accepted.

VII. Concluding Remarks.

27.—In conclusion the committee desire to point out that a well organized and experienced body already exists in Shanghai to form the nucleus of an efficient harbor administration.

The inauguration of a strong public harbor policy at the earliest possible moment is indeed a *sine qua non* for the prosperity of the port, will strengthen the position of Shanghai as the principal transhipment and distributing centre, and will confer immense benefits upon the shipping and commerce of China.

The position of the government is safeguarded throughout the committee's proposed scheme of development and administration, and no burden is placed upon the national exchequer.

A new board in absorbing the present conservancy board would succeed in ownership to works and assets of considerable value. The improvement and deepening which have been carried out and maintained with so much success, the dredging plant and appliances, the workshops and in fact all the belongings of the conservancy board, representing an outlay during the period 1906-1921 of fourteen million taels of which ten millions may be said to be capital expenditure, would become the absolute property of the Shanghai harbor board without any capital liability.

The committee wish to point out that the raising of capital and the general financial success of the scheme outlined above is absolutely dependent on the constitution of the new board being such that there are ample guarantees as to the policy and efficiency of that board's operations. They do not however feel sufficiently informed to detail the personnel for the board beyond saying that commercial interests must be adequately represented and have therefore thought it best to confine their report in this respect to the general recommendations they have made.

The committee most strongly urge the acceptance of their proposals as representing, in their opinion, the best, in fact the only, practicable means of developing the port.

W. M. Black; I. Hiroi; P. G. Hörnell; F. Palmer; L. Perrier; P. J. Ott de Vries; H. von Heidenstam (*Chairman*), *Members of the Committee of Consulting Engineers.*

Shanghai, 30th November, 1921.

Lower Liao River Conservancy

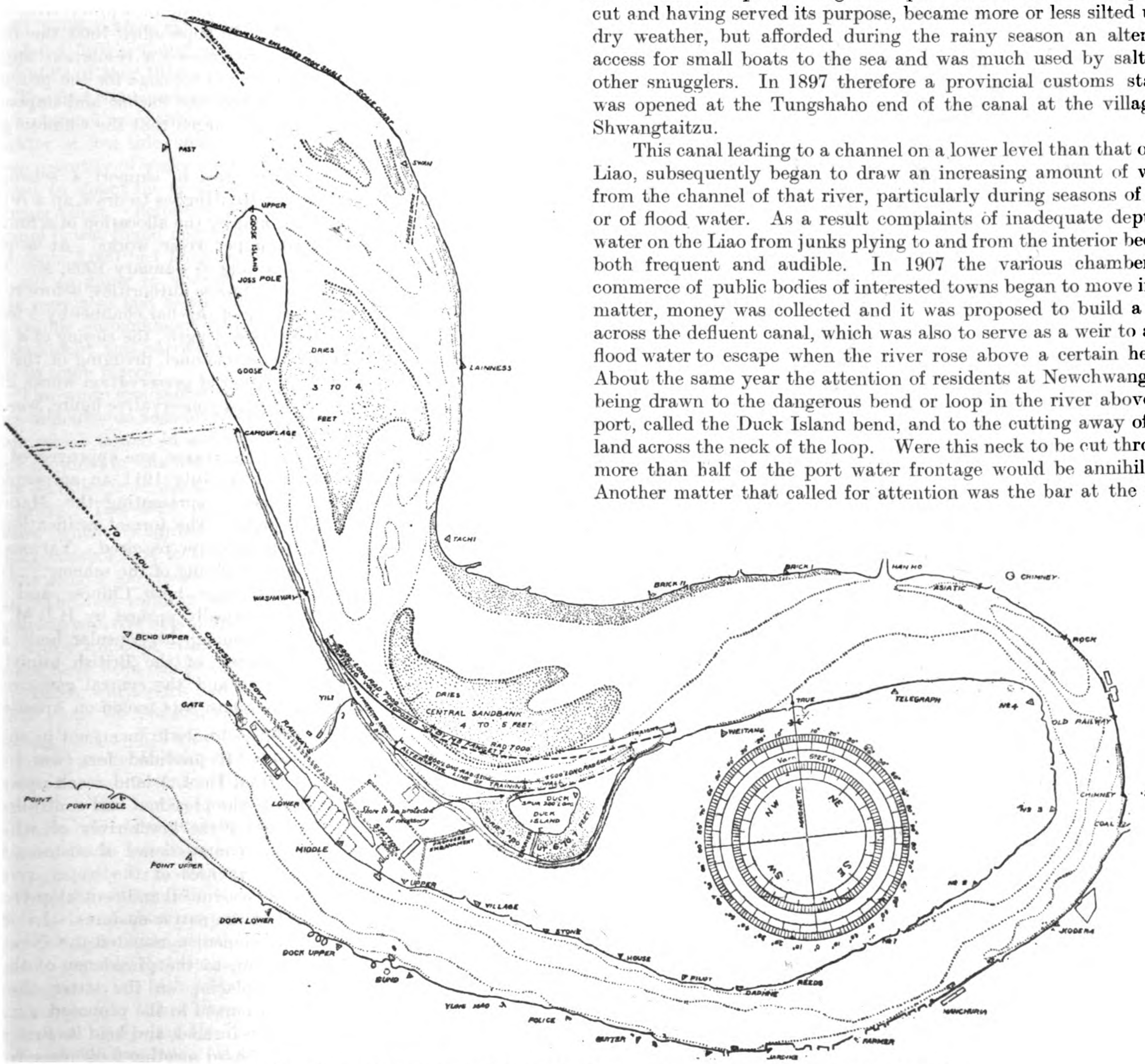
First Annual Report

THE River Liao, at the mouth of which is situated the port of Newchwang (Yingkow), rises in the Mongolian table lands several hundred miles to the north and west of the port. It forms the natural means of communication between the interior and the sea coast. Its principal inland mart and the head of the large class of junk traffic is Tungchiantzu, 30 miles north of Tiehling and some 160 miles N.E. from Yingkow and 255 miles from Yingkow by River, situated just near the junction of the East and West Liao River (see Plan No. 6.) On this river thousands of junks (the number has been placed as high as 40,000) plied a busy trade. Like all alluvial rivers it was subject to change of course and to formation of sand banks. When the entrance to the river was surveyed by H.M.S. *Actaeon* in 1860 the port for sea-going junks was at Tienchwangtai some 30 miles from the sea, while the original sea port that gave its name (Newchwang) to the present town was some 23 miles further inland.

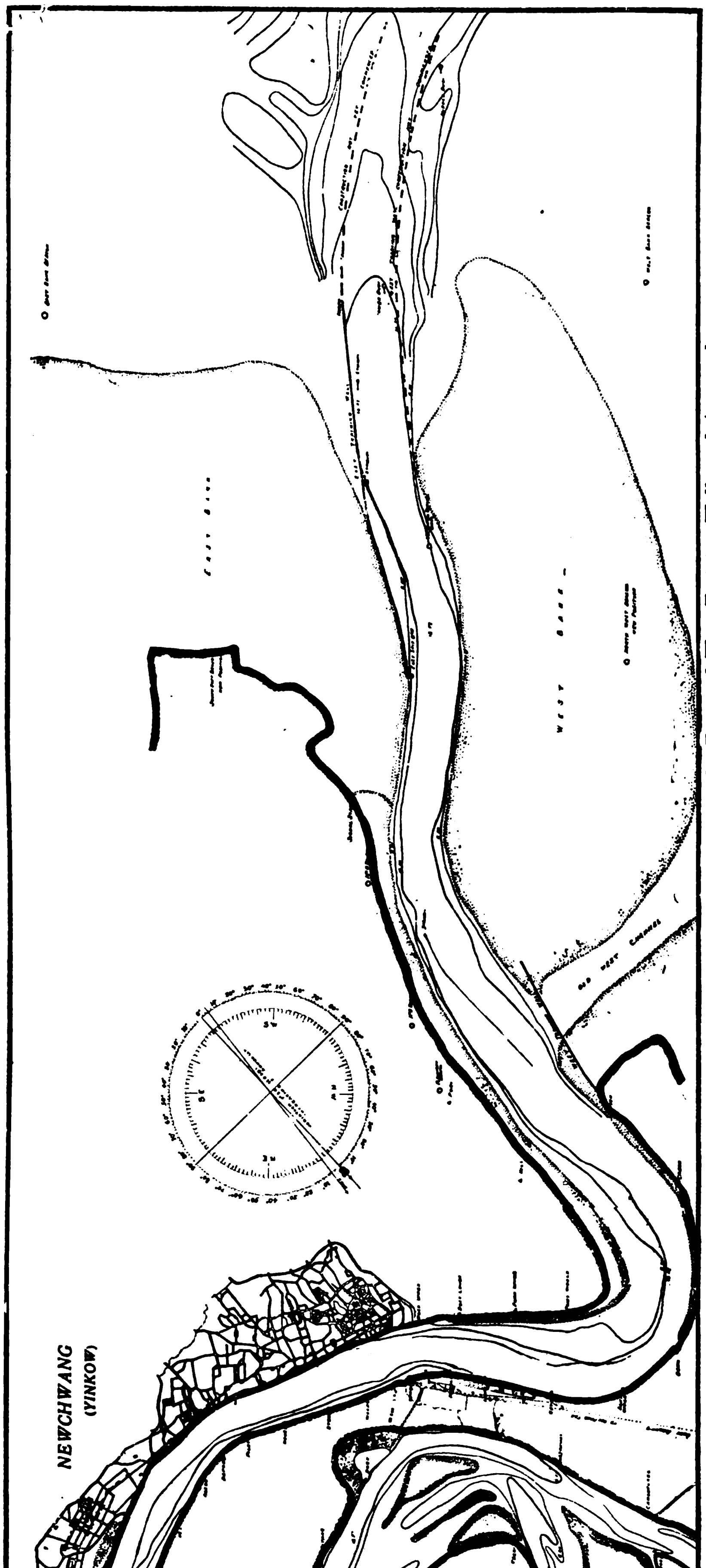
Up to 1889 the river may be said to have discharged its duties in a satisfactory manner. In that year, however, owing to a long continued and a very severe flood a channel of 33 miles in length was cut by villagers and salt smugglers at a spot called Tengchiawupu about 45 miles from the port, to allow of an escape of water westwards into the Tungshaho in order to afford relief to the neighboring country.

This cutting joined the Liao Ho with a tidal stream called the Palipu which at that time flowed as far as Shwangtaitzu being a tributary of the Tungshaho. All these are shown on Plan No. 6. The approximate length of the Shwangtaitzu cut being from Hanchaiwupu to Tengchiawupu. The channel having been cut and having served its purpose, became more or less silted up in dry weather, but afforded during the rainy season an alternate access for small boats to the sea and was much used by salt and other smugglers. In 1897 therefore a provincial customs station was opened at the Tungshaho end of the canal at the village of Shwangtaitzu.

This canal leading to a channel on a lower level than that of the Liao, subsequently began to draw an increasing amount of water from the channel of that river, particularly during seasons of high or of flood water. As a result complaints of inadequate depth of water on the Liao from junks plying to and from the interior became both frequent and audible. In 1907 the various chambers of commerce of public bodies of interested towns began to move in the matter, money was collected and it was proposed to build a dam across the defluent canal, which was also to serve as a weir to allow flood water to escape when the river rose above a certain height. About the same year the attention of residents at Newchwang was being drawn to the dangerous bend or loop in the river above the port, called the Duck Island bend, and to the cutting away of the land across the neck of the loop. Were this neck to be cut through, more than half of the port water frontage would be annihilated. Another matter that called for attention was the bar at the river



Plan of Liao River Conservancy, Showing the Proposed Improvements at Duck Island Bend



Lower Liao River Conservancy from Goose Island to the Sea, Showing the East and West Training Walls and Approaches

mouth which was increasing in length and reported to contain less water than was desirable. Agitation on these matters led to the survey of the bar and river by the marine department of the customs, and on the invitation of the provincial authorities a visit was paid to the spot by Mr. de Rijke, the government's engineer-in-charge of the Huangpu river conservancy at Shanghai.

The work of building a dam to regulate the flow of water from the Liao into the Shwangtaitzu canal was taken in hand in 1908 under the direction of the Manchurian government's engineer Mr. W. R. Hughes, M. Inst. C.E., London. Progress was made but slowly. Completion in 1910 was prevented by the high water of that year and by the immense volume of water passing down the new channel. In the following year just when dam and sluice gates were on the point of completion, the work was wrecked by the rising of the country people. Injury to vested interests and fear of floods were said to be causes of the rising; however this may be the fact remains that the general state of unrest due to the revolution combined with other causes led to the complete cessation of all further work. To such a pitch indeed had local feeling been wrought upon that it was more than a man's life was worth to visit the spot with a view to examine and re-commence operations.

While the work of the government on the upper river was in progress, the movement for the formation of a lower river conservancy board gathered strength. In September 1909 the (foreign) Newchwang chamber of commerce passed a resolution approving of the levy of a surtax on goods and tonnage for the provision of of funds to deepen the bar, protect the harbor and improve the upper course of the Liao. It also urged that the Chinese government should assist.

The readiness of the authorities to support a scheme was shown by their appointment of Mr. Hughes to draw up a report on the resolution of the chamber, and by the allocation of a first grant of two lacs of dollars towards upper river works. At a meeting of the consular body of Newchwang in January 1909, Mr. Hughes laid a copy of his report to the Chinese authorities, before it. The report provided for the deepening of the bar channel by 5 feet with a width of 2,000 feet over its entire length; the closing of a channel on the west known as the bar junk channel, dredging of the harbor in certain places, and the execution of preservation works at Duck Island bend. The estimated cost, a conservative figure, was placed at 600,000 dollars.

The scheme and the levy of surtaxes was approved of by the consular body, and eventually in July 1911 an agreement was signed by the Newchwang taotai representing the Manchurian government and the consular body. The formal ratification of the scheme by the diplomatic body was now required. Various delays due to several causes led to the shelving of the scheme. In 1913, however, local representations, from both Chinese and foreign merchants, supported and energetically pushed by H.B.M. Consul Mr. Hewlett, secured unanimity among the consular body and the new agreement with the assistance of the British minister was ratified by the diplomatic body and the central government in June 1914. A presidential mandate was issued on August 23.

The agreement of 1914 differed only in form, not in substance from that proposed in 1911. It provided for two boards—one for the upper river, *i.e.*, from Duck Island reach upwards, of which the Newchwang taotai is the president and controller under the governor of Fengtien; one for the lower river of which the taotai is the president and the commissioner of customs is vice-president and secretary. The expenses of the upper river conservancy will be defrayed by the provincial and central government, aided by the surtax collected at the native customs. In order to facilitate work the Peking government nominated the Newchwang taotai, now known as the taoyin, to the presidency of the upper and the lower river boards, replacing on the latter the superintendent of customs originally named in the proposed agreement.

The executive committee was formed, and held its first meeting in December 1914 and the first board meeting took place in March 1915. At this meeting the outline plans of the engineer-in-chief

were accepted and sanction was given to the proposal of the executive agreed to by the Manchurian government, that a dredger should be purchased by the boards of the upper and lower conservancy acting together, thereby greatly reducing working expenses. Active enquiries were made with a view to secure an efficient and reliable dredger.

A 7 per cent. loan for 6 lacs of dollars was concluded with the Hongkong and Shanghai Bank and the Russo-Asiatic Bank in equal shares from each Bank, and in 1919 a loan of Haikwan Tls. 400,000 was granted to the lower conservancy board by the inspector-general of customs. It may be of interest to add that the Shwangtaitzu canal has now become a large river entering the gulf about 30 miles west of Yingkow, and that the village of Shwangtaitzu, some 11 miles from the sea, is rising at a rapid rate to a mart of considerable importance. The distance of Tengchiawupu from the sea via Shwangtaitzu being approximately 45 miles as against 95 miles via Yingkow. It naturally follows that the water takes the most direct way to the sea via Shwangtaitzu with the consequent loss of fresh water to the Liao Ho.

The report and plans of the work that has been carried out and the progress that has been made follows: The works under the control of the lower conservancy board consist of the deepening of the bar by the construction of training banks and dredging, the closing of the east and west channels, and the protection of Duck Island bend. After the arrangement of the loan, etc., had been completed, it was found possible to commence work in earnest by the middle of May 1916.

The first to be undertaken was closing the west channel. This was a channel more than a mile in width, with from six to ten feet of water at low tide, some six miles below Newchwang. An immense quantity of water used to be diverted down it, which it was desired to direct on to the bar and so get full advantage of its scouring effect. Before access could be got to the shores of this channel it was found necessary to construct a causeway or path of reed mats 3,000 feet long so that men could safely walk over the soft silt in going to and from their work. Mats of willows and reeds were also laid across the channel to make a foundation for the rubble embankment which was then built upon them. The embankment was carried up to half-tide level, being sixteen feet high in some places.

The work was successfully accomplished, though not without some difficulty on account of the strong tidal current of about seven knots which flowed in and out before the barrier was built. The stone required in this work was procured from quarries on the coast some 30 miles from the mouth of the river, and transported thence by junks. The next work undertaken was the east channel closure which comprises the east training bank which was of similar construction to that across the west channel but of much greater length the closure being three miles long with its continuation. The east training wall, another two miles long, making in all a training wall five miles long and in places 22 feet deep to half-tide.

Three miles of this east training wall and east channel closure have been completed up to the end of this season's operation (1920), when work had to be discontinued owing to the frost which stops all construction work for five months. A similar training bank may have to be constructed on the opposite side of the river parallel to that on the east side, so as partly to constrict the river to its normal width and concentrate the full force of the current on the bar. The protection of Duck Island bend was another work undertaken by the conservancy. In the bye-course between Duck Island and the mainland, erosion had been going on very rapidly for many years past, till the distance across the neck of Duck Island bend on the mainland was reduced to less than 1,500 feet and there was considerable danger that in any great flood the neck would be cut through and the river thus change its course—causing the whole of the river front property of Newchwang to be left high and dry.

To obviate this a dam or embankment was made across the bye-course by the late Mr. Hughes, M. Inst. C.E., where it was 34 feet deep and 600 feet long. It can have been no easy matter to effect this, owing to the strong river current, but fascine mattresses of willows were made 45 feet long and 35 feet wide and sunk in place by loading with stone. Successive layers were superimposed one on the other till the surface of the water was finally reached. Besides the barrier or dam above mentioned, a low dyke was constructed along the river for six miles to prevent it overflowing at that place and so cutting across the neck of the bend. Before finally deciding on the use of training banks, as well as a limited amount of dredging, in December 1915 the opinion was obtained of the firm of consulting engineers, Sir John Wolfe Barry, Lyster and partners on the whole scheme for the improvement of the lower river. Again in 1920 a very complete set of the latest surveys of the bar and river together with current and tidal observations showing the effect that the training walls and works had already had upon the river and bar were forwarded to the consulting engineers, Sir John Wolfe Barry, Lyster and partners together with the report of the engineer, and their opinion again obtained. Their report verifies that of the engineer with the exception that the consulting engineers recommend a slightly different alignment for the proposed training wall at Duck Island bend. The works already carried out at Duck Island can only be of a temporary relief and some work must in future be done there or Newchwang may cease to exist. Since 1917 the construction of the east training wall has been continued, but two miles still remain to be completed. The proposed west training wall is not yet commenced.

Mountain of Sulphur in Pacific

ALMOST contemporaneously with the issue of the mandate of administration for the islands of Nauru and Ocean, famous for their extensive and rich deposits of phosphate of lime was the rediscovery of the great sulphur mountain of Vanua Lava in the Banks group of the New Hebrides. The special agents necessary to change phosphate rock to a soluble state is sulphur. Superphosphate is the powdered and soluble article sold to farmers as a fertilizer.

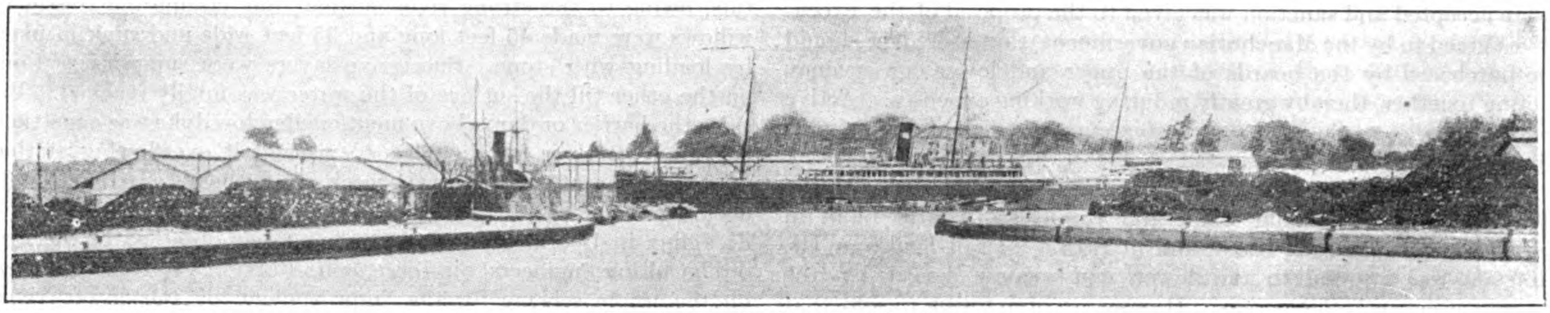
The mountain of Vanua Lava is one vast mass of sulphur, the quantity being 99 per cent sulphur and the balance ash. The height of the mountain, which forms an island in itself, is 1,600 feet, the area of the island being about 100 square miles.

Vanua Lava, as part of the Banks group, is included in the administration of the Condominium government of the New Hebrides. The Banks group lies between the fifteenth and the twentieth degrees of south latitude and is about 900 miles from the Queensland coast.

Condominium Difficulties

Twenty-five years ago a French company began operations on the mountain, employing competent engineers. The company built a long, substantial, coral-concrete wharf and a storehouse in a small bay at the foot of the mountain and constructed an aerial railway up the mountainside for nearly 900 feet. Hundreds of natives were employed in digging out the sulphur and hundreds more in carrying 50-pound bags of sulphur to the railway terminus whence carriers where sent rapidly to the storehouse on the bay The first shipment of sulphur sent to France paid handsomely, but the company suddenly left the field, giving as a reason that malarial fever of a malignant type made it impossible for white men to live on the mountain island.

It was eventually stated, however, that the company had learned that the administration of the New Hebrides was not in a position to guarantee the company a monopoly, a prior right from an Australian engineer, the original discoverer of the commercial possibilities of the island, being in existence. To-day this claim holds good, but Condominium law prevents any prompt commercial activities on the island. A British-Australian company is now endeavoring to begin operations, and has opened up negotiations with the Condominium government.



Entrance to the New Wet Dock

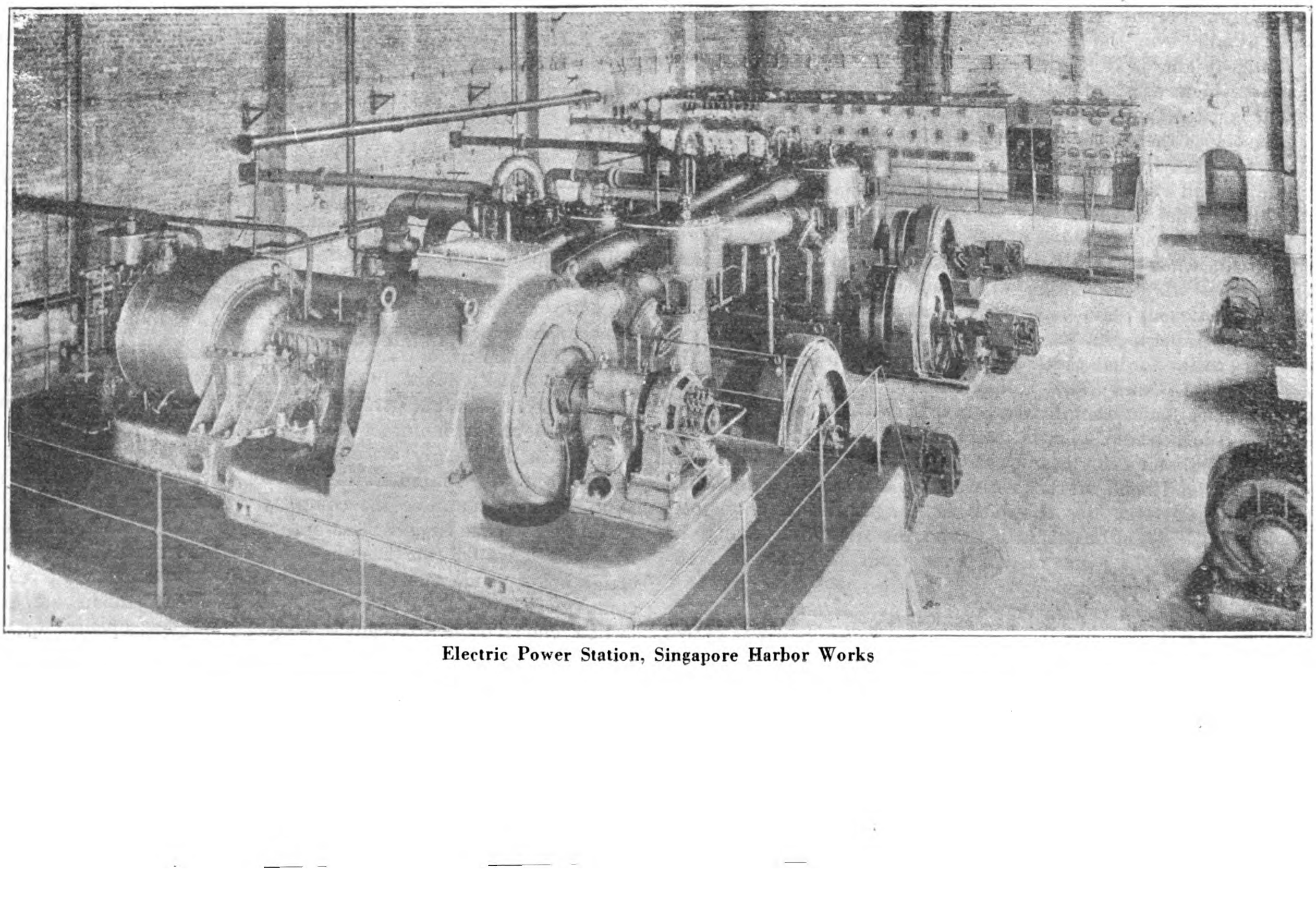
The Singapore Harbor Works

WITH Germany vanquished and India released from the menace of an attack from the west, Singapore becomes the Gateway of Empire, the Gibraltar of the East, the logical headquarters of the British Fleet in the Pacific, the stopping place of all the great lines of passenger and cargo carriers that ply between Europe and Eastern Asia. It is a great harbor with a great history, rivalling Hongkong in its growth, importance and in the magnitude of its improvements. The report and accounts of the Singapore harbor board for the year ending June 30, 1921, just to hand, conveys some idea of the advances made in the traffic and revenues of the port. The gross revenue was $17,493,295; the total tonnage of vessels using the wharves was 5,242,356, about 400,000 tons increase over the preceding year, but less by more than a million tons that of the year 1912, the high water mark of the board in tonnage. The tonnage of cargo handled showed a slight increase over the previous year, but again much less than in 1912.

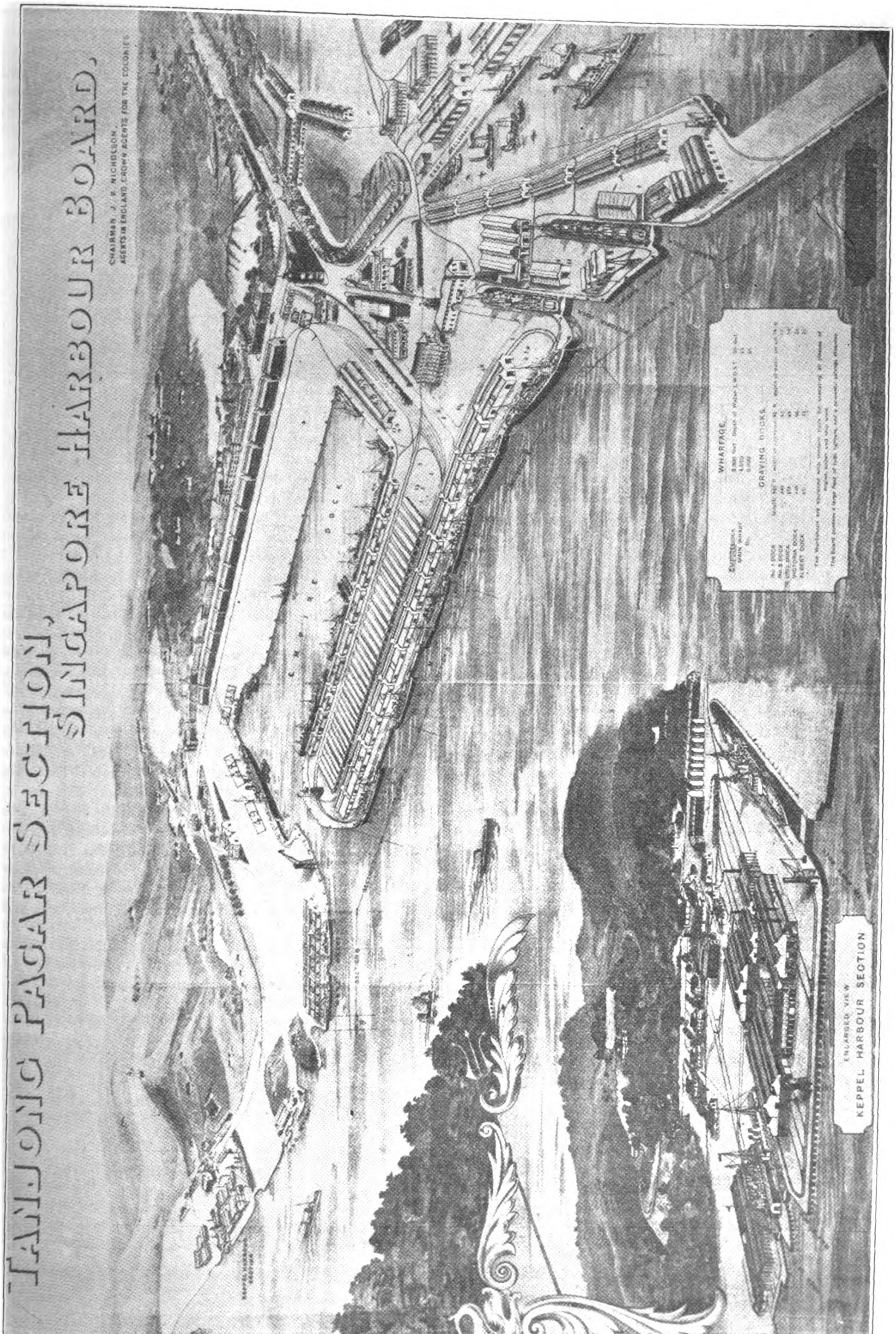
The history of the harbor is the history of Singapore and instead of attempting to give our readers an idea of this great work from the dry statistics of the reports and publications of the harbor authorities, we reproduce extracts from a most excellent and up-to-date description that appeared some time ago in our contemporary, *The London and China Express*, from the pen of Mr. J. R. Nicholson, C.M.G.

As was pointed out in Mr. Nicholson's article, its steady development has been largely due to the enterprise of the Tanjong Pagar Dock Co., formed in 1863. The first proposition was for the construction of a graving dock 550-ft. long with 65-ft. of width of entrance and with 23-ft. of water on the sill. An engineer was engaged in England, who arrived in Singapore in September, 1865, and work actively proceeded on a dock 450-ft. long, which was opened in October, 1868, as the Victoria Dock. The capital of the company was $300,000, the heavy outlay necessary for the completion of the dock being obtained by the issue of 10 per cent. debentures. In 1870 the company leased, in conjunction with the Patent Slip and Dock Co., the Bon Accord Dock. In 1876 the construction of another dock was commenced under Mr. Jackson as engineer, and opened as the Albert Dock in 1879. This dock is 496-ft. long, with 59-ft. width of entrance and with 21-ft. of water on the sill. In the early eighties the directors were much exercised in their minds as to how to deal with the growing tonnage. A railway connection between Tanjong Pagar and the town was proposed in 1866, but fell through. In 1872 a 4-ft. 8½-in. gauge line was laid behind the wharves, worked by horses, but was abandoned. Another large graving dock was proposed in 1885, but the scheme did not meet with success.

In 1885 a large addition was made to the property and wharfage by the purchase of the Borneo Company's property adjoining



Electric Power Station, Singapore Harbor Works

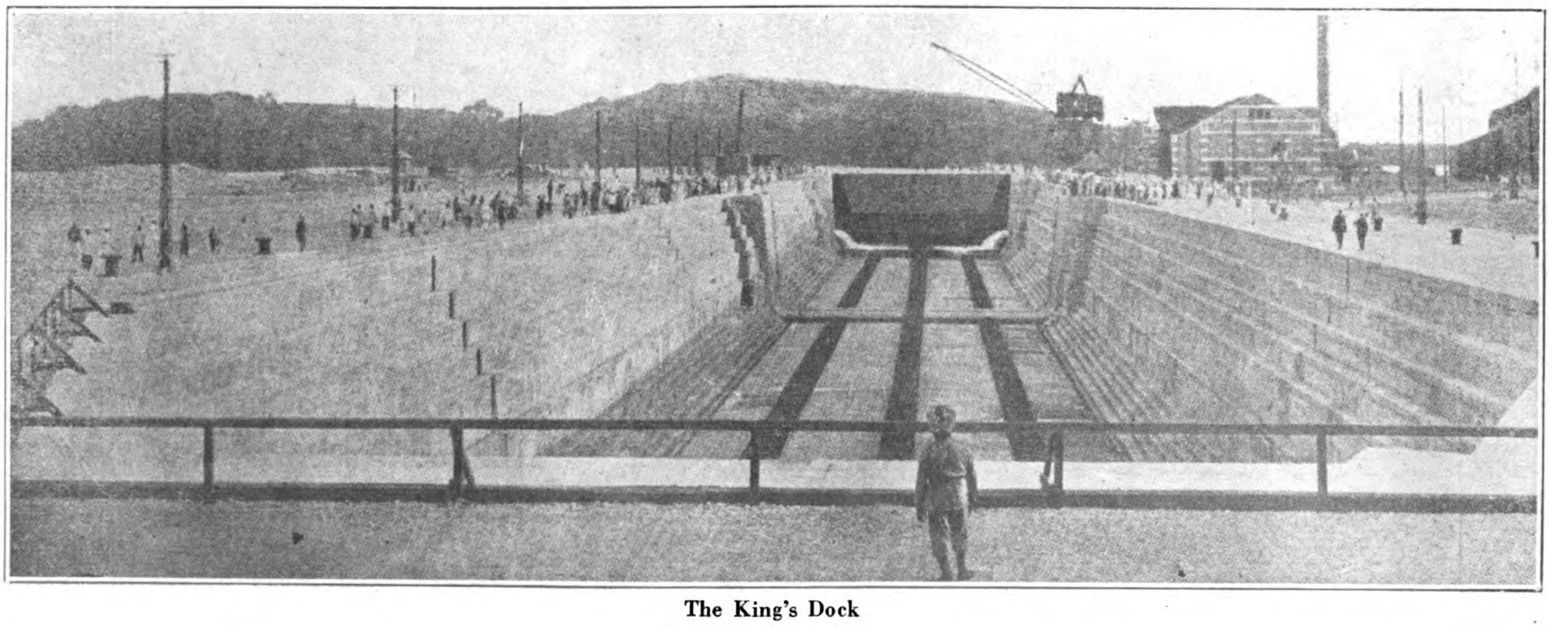

TANJONG PAGAR SECTION,
SINGAPORE HARBOUR BOARD.
CHAIRMAN: J. R. NICHOLSON.
AGENTS IN ENGLAND CROWN AGENTS FOR THE COLONIES.
WHARFAGE.
GRAVING DOCKS.
VICTORIA DOCK
ALBERT DOCK
ENLARGED VIEW
KEPPEL HARBOUR SECTION

Present Method of Transporting Cargo from the Wharves to Town

that of the company's. In 1889 the company extended its operations to Penang by leasing, in conjunction with the New Harbor Dock Co., the Prye Dock. The Singapore Tramway Co.'s lines and rolling stock were purchased in 1889, mainly with the object of facilitating transport of goods to town, but as the business proved unremunerative the lines were closed in 1894. In 1899 the company's capital was raised to $3,000,000, a sum more in accordance with the value of the company's assets than its original capital. In the same year the company purchased the New Harbor Dock Co.'s undertaking, the Prye Dock at Penang being also taken into the fold. The directors since 1874 consistently bought up land adjoining their own property, a policy which afterwards not only proved of benefit to the company, but allowed for the carrying out of the new extension works of the government at much less cost and freedom of design than otherwise would have been the case.

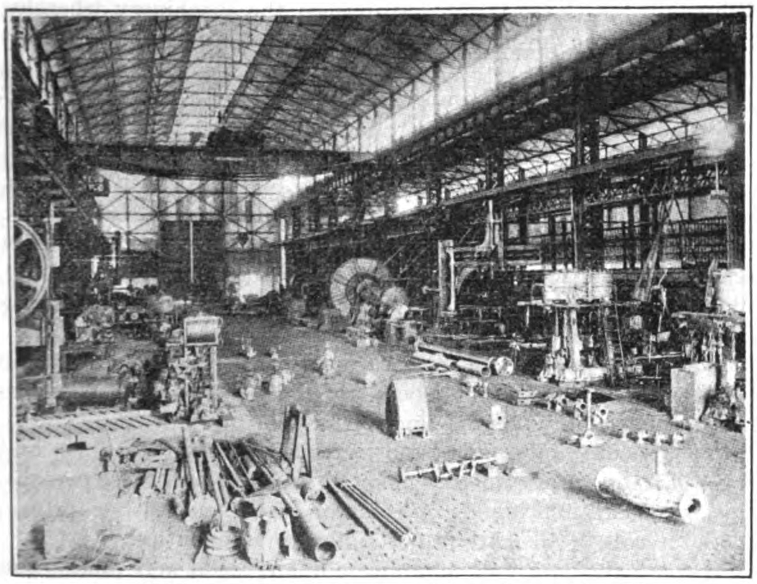
During the 'nineties it became very evident that the shipping facilities provided at Tanjong Pagar were totally inadequate to meet the growing requirements. Various schemes were evolved to remedy matters. Proposals to extend the wharfage to the east alternated with the idea of dredging to allow wharves behind the existing wharves. A dredger was contracted for to carry out the latter idea, but on its delivery it was put to work on the eastern scheme dealing with a material for which it had not been built and was unfitted for. In 1904 a scheme for the reconstruction of the wooden wharves in permanent material and the construction of a wet dock was approved by the directors, but as this scheme involved the expenditure of a sum three times that of the company's capital, differences arose as to how the money was to be raised. The difficulty was solved by the colonial office deciding to expropriate the company's property on behalf of the Straits Settlements government, and that failing a settlement as to the value the question to be decided by arbitration. An ordinance to give effect to this decision was passed by the legislative council in Singapore on April 7, 1905. An offer was made by the government of $240 per share, which not being accepted the value was determined by an arbitration court sitting in Singapore in October, 1905. The court's award was given on July 4, 1906, for $28,453,554, an amount which, after all liquidation expenses were paid, gave each shareholder $761.76 per share. This award raised the capital liabilities of the new owners by ten times that of the old company.

From July, 1905, the management of the property was vested in the Tanjong Pagar dock board. In 1912 an ordinance was passed constituting the board as the Singapore harbor board and definitely defining its duties and jurisdiction. This same ordinance created the "Penang harbor board," with very much the same powers as the Singapore board, both boards being under one chairman as the executive head. A contract was made in February, 1908, with Messrs. John Aird & Co. to construct a wet dock and reconstruct the main wharf at Tanjong Pagar. Towards the end of 1909 the board cancelled their contract, and, taking over



The King's Dock

their plant, continued the work, until a new contract was entered into with Messrs. Topham, Jones and Railton to complete the work, which they successfully carried out, the first vessel to enter the dock being the s.s. *Valdura*, on June 2, 1914. The wharf reconstruction was finished on May 24, 1917. This—the Empire Dock—covers an area of 24½ acres, with a depth of water at low water ordinary spring tides of 30 feet. The quayage at this depth being 3,522 feet in length, the dock is so designed that it can be increased to 35 acres in area, with 5,734 feet of deep-water quayage, and the depth to 33 feet. The width of the entrance is 150 feet.



Keppel Harbor Works—Machine Shops, Large Tool Bay

The dock walls are of solid concrete. The width of the quays is 35 feet. The material removed in the excavation of the dock was sufficient to reclaim over 150 acres of swamp land, which will prove a valuable asset in the future. The old timber wharves westward of the Victoria Dock have been demolished and replaced by two wharves—"Main Wharf," 3,152 feet long from the Victoria Dock entrance to the entrance of the Empire Dock, and the "West Wharf," 1,260 feet long from the Empire Dock entrance to "Jardine Wharf." These two wharves are built of solid concrete block walls to above low-water mark, and to quay level in solid concrete. There are two short sections of these wharves of different construction owing to the great depth at which a solid foundation was found, one section being of iron cylinders filled with concrete supporting a troughed steel decking overlaid with granolithic concrete, the other being of ferro-concrete construction. The quays are 45 feet wide, giving ample space for the handling of cargo, railways, etc. All quays slope at an incline of 1 in 60 back from the coping through the godowns to the loading platforms. This slope brings the loading platform on the same level as the floor of railway trucks and carts. The standard godowns are 200 feet long by 100 feet wide, well ventilated and with an overhanging roof on both sides, that on the wharf side giving cover to rough cargo, and on the other side affording cover for loading or discharging trucks. The cost of the works comprised in the wet docks and wharf reconstruction amounted to $18,886,225.

On January 1, 1909, another contract was made with Messrs. Topham, Jones and Railton for the construction of a large graving dock, completed and opened as the "King's Dock" on August 26, 1913. This dock, the largest in the East, is 879 feet long, and by placing the caisson in the outer step the length is increased to 895 feet, the entrance being 100 feet wide, depth of water on the sill 34 feet. It is divided into two by a caisson, so that, if necessary, a vessel of 500 feet long requiring a length of time in the dock can be placed in the inner portion, leaving the outer portion for use of vessels up to 346 feet in length. The outer and inner caissons are interchangeable. These caissons weigh 826 tons each.

Prior to its construction the greater part of the area was covered by water at high tide, so that the first operation was to dry the site. A watertight embankment was run out from the shore. In continuation of this bank, a cofferdam was driven enclosing the seaward end of the dock and joining in with the existing reclamation to the westward. The area enclosed was cleared of water and excavation commenced. The material derived from the excavations was used for filling up and raising the general area of the ground around the dock. The emptying culvert for the inner dock is carried through the body of the west wall, and thence to the pumping station installed a short distance inside the outer entrance and adjoining the west wall of the dock. The corresponding culvert for the outer dock is carried directly across from that dock, and filling culverts are provided in each wall at both the inner and outer entrance.

The dock is constructed of concrete, with Cornish granite ashlar entrances. Three rows of keel blocks are provided. The pumping plant consists of two sets of compound engines driving two 60-inch pumps, supplied by Messrs. J. and H. Gwynne & Co., of London. This plant is capable of emptying the dock of its 22,000,000 gallons in less than two hours, approximately at the rate of 820 tons per minute. The main pumps consisted of two "Invincible" centrifugal pumps, having double suction pipes 42-in. diameter, and single discharge pipes, 60-in. diameter, driven by vertical direct-acting compound engines, working at 150-lb. pressure. It was required of the pumps that they should together be capable of emptying the dock in three hours. As a matter of fact, at the time of the trials, this was accomplished, as we have mentioned, in less than two hours. Each pump is provided on the discharge side with a sluice valve actuated by an electric motor, these sluices being in addition to the non-return valves already referred to. For drainage purposes, two 12-in. centrifugal pumps are used, each being capable of delivering 2,500 gallons per minute against a head of 50-ft. of water. These pumps are driven by electric motors. The capacity of the dock at high water is about 3,570,000 cub. ft., the total lift from the dock bottom at high water being about 39-ft. to 54-ft. The foundations of the engine-house consist of Portland cement concrete carried well down into the shale. The two emptying culverts, to which reference has already been made, are led into a main sump running the whole length of the engine house, and formed in the concrete base. The centre of the engine-house is in the form of a deep well, in which the pumps are placed, the pump suctions being carried down through the concrete into the main sump. As a necessary precautionary measure an asphalte damp-course is provided below the floor of the engine-house, and continued up the back of the walls, so as to prevent the moisture percolating into the well, for it will be noticed that the floor of the well is considerably below the level of low water. The face of the well is lined with white glazed brick, for cleanliness, and also to give light.

The discharges from the pumps are formed of cast-iron segments, built into the concrete. They lead from the pumps into a chamber situated immediately outside the engine-house, the discharge outlets into this chamber being provided with non-return valves. A large culvert is laid from the further side of this chamber, which finally discharges into the harbor outside the outer entrance through the western-wing wall. Between the two main pumps are a pair of drainage pumps with suction and discharge pipes.

Immediately adjoining the engine-house is the boiler-house. In order to save expense in foundations, this building is carried throughout upon bearing piles driven down to the shale. Three Babcock and Wilcox water-tube boilers have been provided, and space is left in the boiler-house for another set if this should be required hereafter. The working boiler pressure is 160-lb. Superheaters and an oil eliminator are also provided. In connection with the boilers, an induced-draught plant has been introduced. As previously mentioned, two caissons have been provided. They consist of steel plating supported by angle-steel frames, these being stiffened and strutted as required, and the top surface of each

caisson is decked over to form a roadway, being also provided with rails for railway traffic. A 15-ton traveling electric crane serves one side of the dock, and a 5-ton the other. The dock is well provided with capstans of 10 and 5 tons capacity, electrically driven, as are the motors operating the penstocks. The cost of this dock and equipment amounted to $3,697,000.

In close proximity to this dock are two others, formerly the property of the New Harbor Dock Company. One was reconstructed in 1907, being 380-ft. long, 45-ft. width of entrance, with 14-ft. of water on the sill; the other being 463-ft. long, with 64-ft. width of entrance, and 17-ft. of water on the sill. The workshops attached to these docks have been entirely reconstructed, and are fitted with suitable machinery for dealing with the heaviest repairs to large vessels. All machines are electrically driven, as is all machinery throughout the property, with the exception of the large pumps of the "King's Dock." The electric power station contains a turbo-generator of 1,200 kw. capacity, also three high-speed triple-expansion sets, two of 400 kw. each and one of 200 kw. Superheated steam is supplied by three high-capacity Babcock and Wilcox water-tube boilers. Mechanical-induced draught can be used in the case of any sudden demand of increased power being called for.

The whole extension and reconstruction scheme has been laid out with a view of expansion as the demands of the future may require, there being ample room and strength to carry larger godowns and the erection of any mechanical device for labor-saving. The present godown floor area at Tanjong Pagar being nearly 20 acres, there is storage space available for 200,000 tons of coal. Eleven miles of railways and 13 miles of roadways connect the various sections. The main roads are 75-ft. wide, and the railways connect with the Malay States railway system, so that it is now possible to send loaded trucks from the ship's side at Tanjong Pagar direct to Bangkok. Designs have been prepared for a coaling wharf 1,200-ft. long, to be fitted with mechanical appliances for dealing with coal cargoes and bunkering, but owing to the exigencies of the war its construction has been postponed.

In 1907 a contract was let by the government to Sir John Jackson, Ltd., for the construction of wharves, with a protecting breakwater 5,650-ft. long, at Teluk Ayer. The original contract was for a continuous line of wharf 4,990-ft. long, but during construction the design was altered to allow of a boat harbor behind this wharf. This contract has been completed, with two wharves 1,570-ft. and 2,500-ft. respectively in length, with an opening between to the boat harbor, the depth of water alongside these wharves to be 18-ft. at low water spring tides on the sea side, and 7-ft. in the boat harbor. The completion of the boat harbor has been postponed on account of the difficulty in dredging work due to war contingencies. This harbor will be 18 acres in area, the sides to be finished in steps so as to facilitate the loading and unloading of lighters at any state of the tide. Seventy acres of land have been reclaimed by these works, and it is regrettable that the necessity of postponing the dredging has prevented the building of godowns on this area (which are so much required) owing to the danger from settlements which will inevitably occur on some parts of it during the operations. When completed this scheme will afford a great relief to the river traffic, much congested at present, but which cannot be relieved except at a cost of works to prevent silting out of all proportion to the results achieved.

Aircraft Chamber of Commerce

ORGANIZATION of the aircraft industry into a national body known as the Aeronautical Chamber of Commerce of America, with approximately 100 charter or founder members embracing the designing, constructing, operating and kindred elements and representing virtually every section of the United States has been been brought about through the initiation of the Manufacturers Aircraft Association. Among other things, it will develop the market and increase the use of flying machines among civilians, corporations and transportation companies.

The aircraft industry thus follows the example of all other modern industries which owe their resent greatness in no small measure to the trade association. Organization of the Aeronautical Chamber of Commerce, following as it does the creation of the Bureau of Aeronautics in the Navy Department, and provision, in the Wadsworth-Hicks Bill for a Commissioner of Civil Aviation in the Department of Commerce, and the nationalization and extension of the Aero Club of America, completes the accomplishments for the year and establishes the machinery whereby, it is believed, the development of American aviation will be greatly hastened.

The Aeronautical Chamber of Commerce of America is incorporated under the laws of the State of New York. Among its aims and purposes, as set forth in the Charter, are:

To foster, advance, promulgate, and promote trade and commerce, throughout the United States, its territories, possessions, and in foreign countries, in the interests of those persons, firms or corporations engaged in the business of manufacturing, buying, selling and dealing in aircraft, aircraft motors, and aircraft parts and accessories of every kind and nature.

To diffuse among its members accurate and reliable information as to the standing of its members and those persons, firms or corporations engaged in similar lines of business.

To procure uniformity and certainty in the customs and usages of trade and commerce among its members and those persons, firms or corporations having a common trade, business or professional interest in all matters pertaining to aeronautics.

To aid and assist in mapping out air roads and lanes; the location of landing fields, airdromes, hangars, or such other structures as may be necessary for the advancement of aeronautics.

To advocate and promote in every lawful way the enactment of just and equitable laws pertaining to aeronautics.

To settle, adjust and arbitrate any and all differences which may arise between its members, and persons, firms or corporations dealing with them.

To promote a more enlarged and friendly intercourse between its members and persons, firms and corporations engaged in the business of, or dealing in aircraft, aircraft motors and aircraft parts and accessories, and generally to do every act and thing which may be necessary and proper for the advancement of the aeronautical art and industry and the accomplishment of the objects and purposes hereinbefore set forth; provided, however, that nothing herein contained shall authorize this corporation to engage in any business for pecuniary profit.

The need for a central trade organization, including within its membership all of the responsible and permanent financial and professional interests in aviation in the country, has been felt for some time.

"The existence of the Manufacturers Aircraft Association partly met the need. Its work has been characterized by a broad public-spirited attitude toward the entire industry and has been effective, but its members were the first to realize that an organization limited simply to manufacturers of airplanes, having, primarily, a common interest in the exchange of licenses for the use of patents, could not hope adequately to give representation to the entire field.

"The new organization has taken over the offices and equipment of the Manufacturers Aircraft Association at 501 Fifth Avenue, New York City. The latter organization will continue to serve its members in handling the administration of the cross license agreement covering airplane patents. The Aeronautical Chamber of Commerce will assume and greatly extend all of the functions formerly handled by the older organization, including the collection and dissemination of information regarding aeronautical activities in this and other countries; the publication of the Aircraft Year Book; and the furnishing of special services to its members through its various departments and committees.

Rangoon Port Improvements

RANGOON, which is now the principal port in Burma, became a regularly established port in 1853. For many years afterwards a government flotilla was kept up for the conveyance of troops and government stores only on the Irrawaddy River, together with a dockyard and workshops in Rangoon for repairing the steamers and flats, etc. Both flotilla and buildings were taken over in 1864 by the Irrawaddy Flotilla Company, established in Glasgow, which has now a very large fleet of river craft.

Rangoon became the seat of local government in 1862. It had made but moderate progress as a port during the preceding ten years of British occupation. A lightship had been placed at the mouth of the river (in June, 1852), and a wooden wharf had been built in the port itself (in 1859). The earliest statistics readily available are for the official year 1861-62. In that year the receipts of the Rangoon port fund, including Rs. 5,174 wharfage, aggregated Rs. 60,072, "showing an increase of nearly 100 per cent. over the previous year"; and the expenditure amounted to Rs. 44,940, most of which was on account of establishments, stores and repairs to the light-vessel and boats. The number of vessels which entered the port in 1861-62 was 438, with a tonnage of 157,472, equal to 340 tons per vessel. The bulk of the trade at this time was coastwise, but few vessels entering the port direct from foreign countries; and most of the goods were landed on the bank of the river from cargo-boats. The value of the imports in the year above mentioned was Rs. 1,23,87,679, and of the exports Rs. 1,40,26,752, a total of Rs. 2,64,14,431.

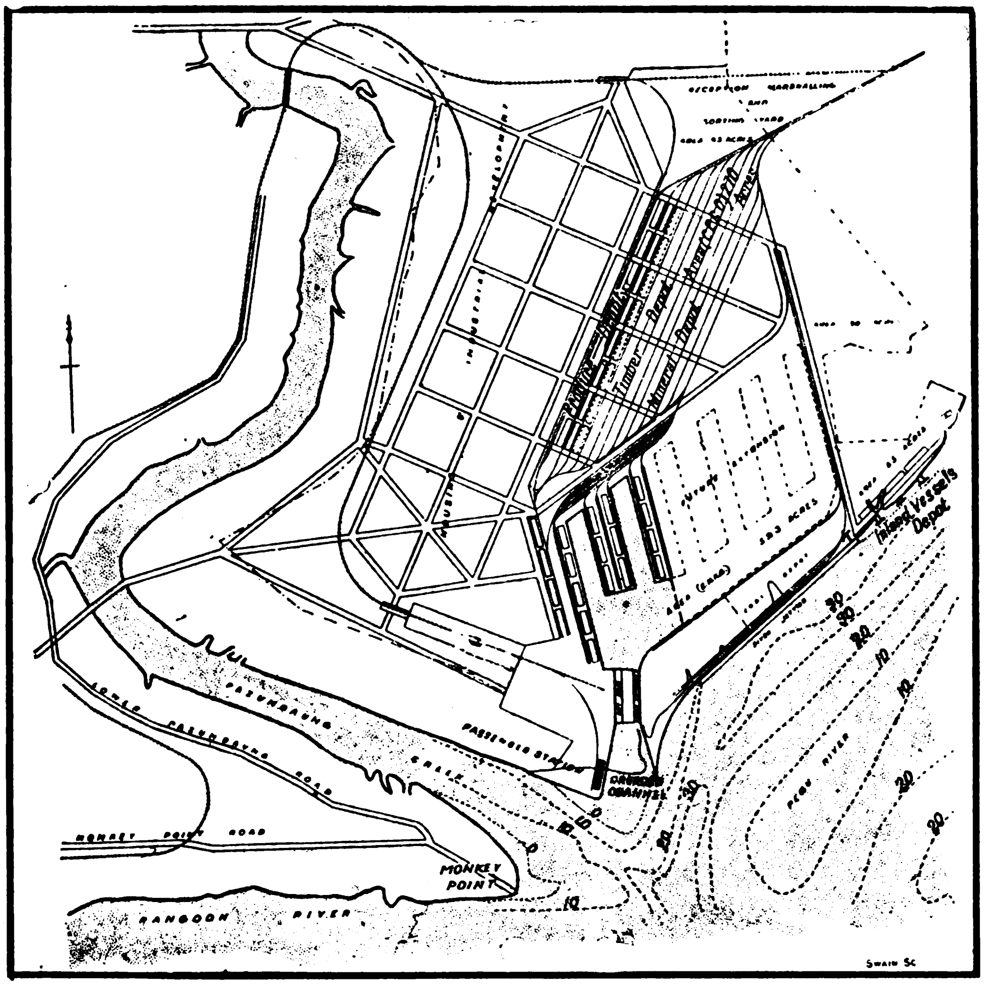


Fig 1. Plan of Proposed New Dock at Rangoon

The wharves and jetties were situated in the foreshore known as the Strand bank, which was supervised by the magistrate up to July, 1874, when it was placed in charge of the president of the Municipality. Almost all the revenue derived from it for about twenty-three years had been appropriated for the benefit of the town, a very small proportion having been expended on port improvement. In June, 1876, the management of the Strand bank, which was reserved from municipal limits under a special notification at the date of the inauguration of the municipality, was handed over to a committee consisting of the master-attendant, collector of customs and the executive engineer, and all the revenue collected was expended in providing accommodation for boats and in improving the foreshore generally. In June, 1878, the governor-general in council approved the proposal to create a trust, and a corporate body known as the commissioners for the port of Rangoon was formed with effect from January 1st, 1880.

When the commissioners took charge there were three fixed jetties and one pontoon jetty for the accommodation of sea-going steamers, there small fixed jetties for boat traffic, and two small jetties for passengers. For the inland traffic the Irrawaddy Flotilla Company had three small pontoon jetties, but there was no public jetty accommodation available. There were no moorings in the port. In 1880-81 the number of vessels entering the port was 874, of which 478 were steamers, 199 European sailing vessels, and 197 native craft with a total net tonnage of 598,303. In 1920-21 the number of vessels entering the port was 1,303 steamers and 398 native sailing vessels, with a total net tonnage of 2,300,513.

Statistics of the tonnage of goods landed and shipped in 1880-81 are not available, but the value of the trade of the port was Rs. 10,38,68,938. In 1920-21 the sea-borne trade aggregated 4,037,923 tons, while the value was Rs. 87,95,43,447. The export trade alone totaled nearly three million tons, whilst imports exceeded one million tons. In addition, there was continually expanding inland water-borne traffic, of which the Irrawaddy Flotilla Company has the greatest share, with its volume in 1920-21 of some 765,000 tons.

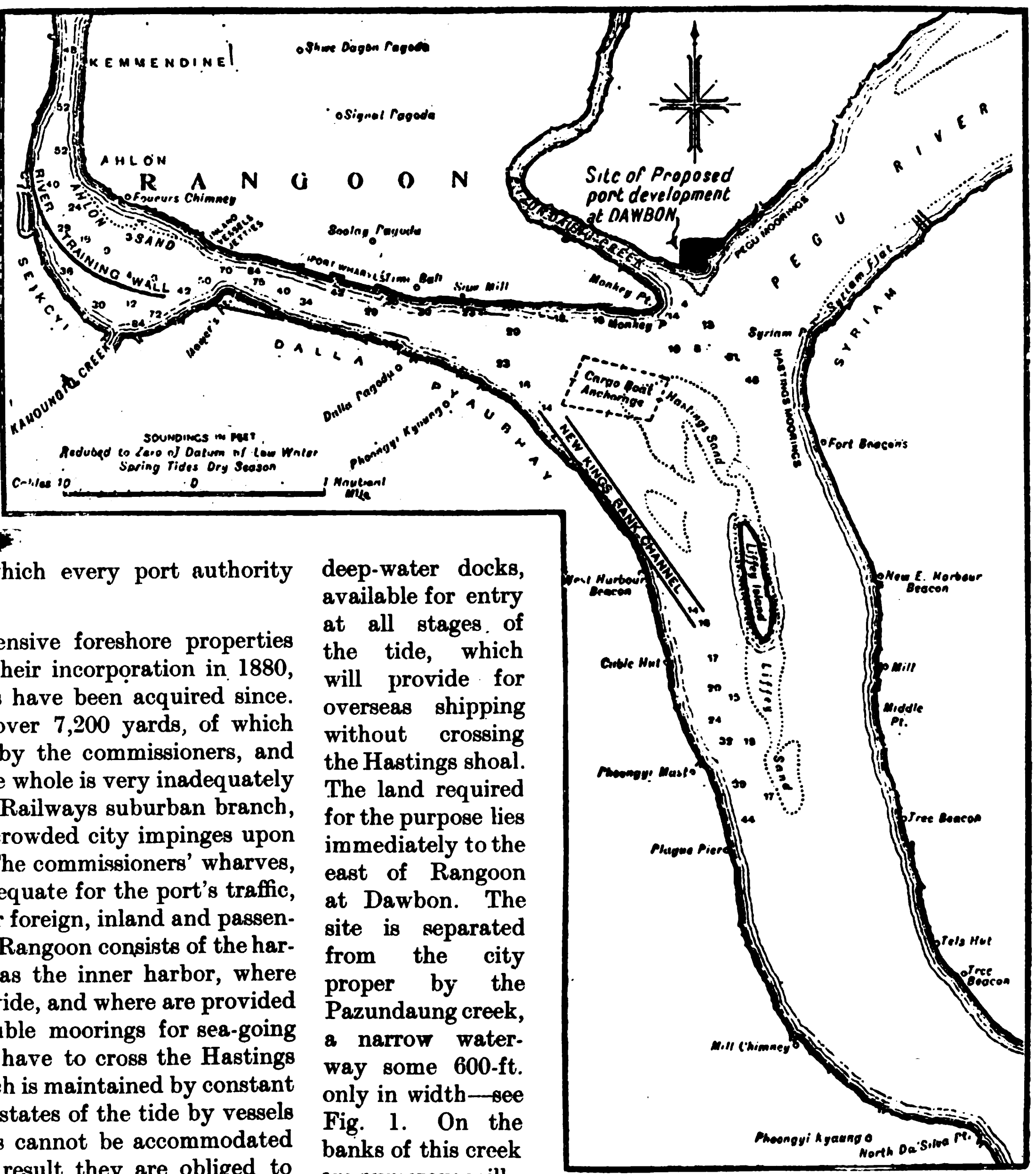
Mention has not hitherto been made of the immigrant traffic of the port of Rangoon to and from India. This is of a seasonal character, Burma being largely dependent on Indian immigrants for the bulk of her labor supply. The number of immigrant passengers through Rangoon exceeds 250,000 in each direction yearly, and complaints of poor treatment and of delays on arrival owing to medical and other inspections have been a subject of agitation for many years. Much of the trouble has been admittedly due to the inadequate landing arrangements provided in the port, and there is no doubt that the conditions for third-class passengers have been distinctly unfavorable.

The administration of the port is vested, under the Rangoon port act, in a representative public body, the commissioners for the port of Rangoon, which has as its present chairman Mr. J. A.

Cherry, C.I.E., M.L.C., barrister-at-law, who was appointed to that position in December, 1920. In its early days, the Rangoon port commission was administered by a vice-chairman; in 1901, Mr. (now Sir) George C. Buchanan, a civil engineer, became its head, combining the offices of chairman and chief engineer, and this was continued when, in 1915, Sir George Buchanan left for Mesopotamia, until Mr. Holmes retired in 1920. Mr. Cherry's appointment, as a man with business and port experience, marked the separation of the two offices of chairman and chief engineer. The business needs of the port have grown to such an extent that they demand attention separate from the engineering problems with which every port authority has to cope.

Certain existing wharves and extensive foreshore properties were vested in the commissioners on their incorporation in 1880, and from time to time other properties have been acquired since. The foreshore on the harbor extends over 7,200 yards, of which approximately two-thirds is occupied by the commissioners, and developed for port traffic purposes. The whole is very inadequately served by the single line of the Burma Railways suburban branch, and improvement is impossible as the crowded city impinges upon the foreshore along its whole length, The commissioners' wharves, jetties and pontoons are becoming inadequate for the port's traffic, and improved and increased facilities for foreign, inland and passenger traffic are imperative. The port of Rangoon consists of the harbor proper, or what may be described as the inner harbor, where the Rangoon River is some 800 yards wide, and where are provided fourteen swinging and eight fixed double moorings for sea-going craft. To reach the harbor all vessels have to cross the Hastings shoal by the Monkey Point channel, which is maintained by constant dredging, and can be entered at certain states of the tide by vessels up to 33-ft. draft, but these deep vessels cannot be accommodated to that draft, in the harbor, with a result they are obliged to complete their loading below the Hastings, where the commissioners maintain five swinging and six fixed moorings. The Hastings shoal is situated below Rangoon at the junction of the Rangoon River, the Pegu River and the Pazundaung creek, and for very many years has been a serious menace to the port of Rangoon. Erosion of the river bank for years has been taking place, and the Hastings shoal has at the same time enormously increased in size. A project of river training walls and dredging to secure a channel through the Hastings shoal was propounded in 1920 by the Commissioners' consulting engineers, Messrs. Meik and Buchanan, which was estimated to involve an expenditure of approximately 2 crores of rupees. The scheme did no more than propose to safeguard the existing inner harbor (the accommodation in which is already overtaxed), and the costly acquisition of foreshore sites now in commercial occupation would have been necessary in addition to provide an extension of port facilities.

Since the war a number of proposals have been made in connection with the port's development, and these have culminated in what may be described as the present chairman's Dawbon dock scheme. Mr. Cherry's scheme of future port development, which has been approved by a government conference, by the port commissioners, and in its general aspects by the Burma chamber of commerce, is a complete departure from any attempt to meet the problem of expansion by continuing on past methods. While retaining all the existing accommodation in the harbor and remodelling it to better advantage, it is now proposed to construct deep-water docks, available for entry at all stages of the tide, which will provide for overseas shipping without crossing the Hastings shoal. The land required for the purpose lies immediately to the east of Rangoon at Dawbon. The site is separated from the city proper by the Pazundaung creek, a narrow waterway some 600-ft. only in width—see Fig. 1. On the banks of this creek are numerous mills, on the Rangoon as well as on the Dawbon banks, and railway connection already exists between the provincial main line and Dawbon. The area to be developed approximates 2,000 acres and is at present low-lying paddy land entirely utilized for agricultural purposes, which it is anticipated will be inexpensively acquired. Out of this area some 600 acres are ear-marked for docks. As a beginning it is proposed to construct fifteen berths for large foreign-going vessels. Expansion over the whole reserved area will eventually provide a total of forty-eight berths. Adjacent to the docks will be a large area for produce, timber and mineral depôts, whilst between the "port" area and the city of Rangoon there will be approximately 1,000 acres available for housing and general industrial development. The whole will be adequately served by rail, affording direct connection between the docks and the main railway system of the province. The scheme is primarily designed to provide for rail-borne traffic, but eventually every facility for all kinds of port traffic will be given.



Rangoon and Proposed New Dock Site

Two bridges are projected to connect Rangoon and Dawbon to carry tramways and vehicular traffic of every description. On the Pegu River side of the docks will be a depôt for inland vessels and for coal; the latter served by rail and by jetties for direct unloading and for bunkering by lighters. The outer entrance to the dock will serve as a tidal basin, in which the largest ships can lie in slack water before passing through the lock-way, and

will be approached by a short dredged channel with a depth of 35-ft. at L. W. S. T. The entrance lock will have a width of 80-ft. to 100-ft., and, alongside, a dry dock capable of taking the largest ships ever likely to visit the port will be provided. On one of the quays at the outer entrance a passenger station will be erected and connected with the main railway system. In the immediate vicinity land will be available for workshop sites, and the commissioners propose to establish their own workshops and slipways in the neighborhood of the dock entrance.

The completion of the Dawbon dock scheme will at once set free much foreshore on the harbor that has hitherto been earmarked for traffic development, and it will be possible to give necessary relief to the congested Indian, coasting and inland waterborne traffic by utilizing the facilities that have had to be reserved for the foreign traffic. It will also be possible to make adequate provision without further delay for the immigrant passenger traffic of the port. The Dawbon dock scheme proposals will be in augmentation of the existing port facilities, and moorings will be maintained in the harbor of vessels to load direct from lighters; but the volume of rail-borne traffic in mineral, timber, cotton, grain, seeds, etc., for overseas will steadily increase and will be diverted to the docks, where the adjacent depôts will provide godowns for the occupation of merchants, where re-bagging, cleaning, pressing, etc., operations will be possible.

In connection with the dock scheme Mr. E. C. Niven, M. Inst. C.E., chief engineer of the port commissioners, has put forward proposals for a modified scheme of river training in the vicinity of the Hastings shoal, which, at a cost of some 30 lakhs of rupees only, will, within seven years, restore the area lost by erosion and will improve the channel into the harbor by contracting the width of the Rangoon River. His scheme will, it is anticipated, be all that is necessary for the maintenance of the inner harbor, and will be in substitution of Messrs. Meik and Buchanan's two crores project.

A noteworthy feature of the new dock scheme is that it avoids the necessity for vessels crossing the Hastings shoal and the cost of making and maintaining a deep-water channel across it and into the inner harbor, which would involve large expenditure without providing any new source of revenue or increasing accommodation in the port. It is estimated that the Dawbon dock scheme will more than pay for itself, and will provide for unlimited and inevitable expansion of provincial trade. The scheme will directly benefit the cultivator and, it is anticipated, will have an immediate effect in a reduction of shipping costs. It is being projected in close association with the Rangoon Development Trust, which, for its part, will undertake development for housing and industrial purposes. The Burma Railways Company is wholly in favor of the project, as it will provide for railway expansion in a manner quite impossible in the present port of Rangoon. The government conference, presided over by the development commissioner, expressed unanimous approval of the project after a very careful discussion. The port commissioners, meeting after the government conference, unanimously accepted the general scheme and have approved of the necessary preliminary works, such as land and river surveys, substrata borings, tidal and current observations, and the preparation of a provisional lay-out. These works are now actually in hand, but it is anticipated that two years must elapse before actual construction can commence, and that it will be seven or eight years before the new dock will be in such a condition as to receive shipping.

Mr. Cherry, who has had in the elaboration of his project the assistance of Mr. E. C. Niven and the co-operation of Mr. C. Morgan Webb, C.I.E., I.C.S., chairman, Rangoon Development Trust, and Mr. H. V. Lancaster, F.R.I.B.A., town planning expert, has, with courage, enterprise and foresight, produced proposals which, when completed, will, it is anticipated, place Rangoon in the select list of the world's best equipped, most efficient and most prosperous ports.—*The Engineer.*

Harbin Tramways

A TRAMWAY system for Harbin seems assured. There has been much backing and filling, and there have been times in the life of the franchise when it looked as if the whole plan would he declared off says the *North China Star.*

But now an American engineering firm has taken the contract, and makes the statement that a great part of the material necessary for the construction has already been purchased in the Uuited States. The track laying will begin in April, if the ground has thawed sufficiently by that time, and by the end of 1922, the cars will be running. There are grave engineering problems to be worked out, especially in crossing the Chinese Eastern Railroad, which it appears must be a job of tunnelling.

The franchise which has been granted is on its face all in favor of the city, but there may be jokers, with which the public is not familiar. The franchise provides that the company must build the line within two years, and thirteen years thereafter must turn it over to the city as a free gift.

The company must pay the city thirty percent of the net profits for nine years and then for four years thirty-five percent. The city names men to draw salaries from the company and has equal voice in the management of the company both during the construction and operating periods, in addition to which the city fixes the tariffs, giving the city employes free rides and naming certain groups which shall get special rates.

It looks pretty soft for the city, but that is not all. The company guarantees the city a net income from its share of the net profits during thirteen years of not less than three million eight hundred thousand gold rubles, or expressed in U. S. dollars, $1,900,-000.

The city names the streets, and under what conditions the cars may run on them. The city gets for the use of its buildings and for the streets, electric current without profit to the company, and the company builds for the city free of charge a fire singal system.

A special system of lighting equipment is to be erected in the principal streets of the city without cost to the city. Moreover, the company will lend the city, at the date of signing the contract, a half a million gold rubles, without interest, to be repaid to the company out of the city's share of the net earnings. It may furnish amusement for some banker to figure the interest, and the compounded interest, that will be involved in this loan.

The explanation of all this seems to lie in the fact that a Japanese company was in the market for the tramway franchise, and the Chinese company that secured it had to do some grand and lefty promising in order to keep their competitors out. The Japanese have an electric light contract with the city, and have an extensive system of wiring and poles on the Harbin streets.

The Japanese company that was after the franchise has filed a protest against the awarding of the contract to the Chinese, and it is provided that the electric light company will have to remove its poles from the city streets in order that the new concern may erect its equipment, and begin furnishing the city with light and transportation. The Japanese electric light contract is said to be terminable upon notice from the city.

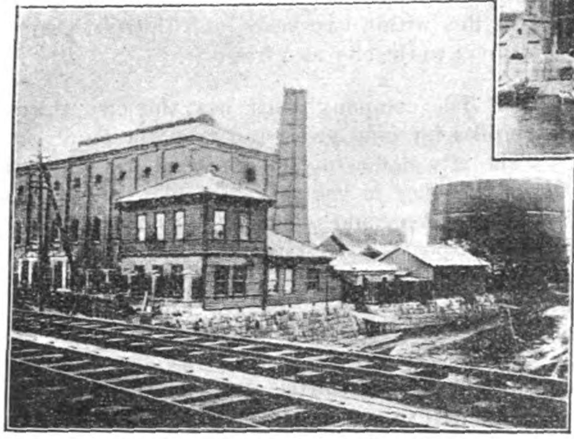
The entire situation seems fraught with opportunities of litigation, and with the apparent lack of definite knowledge of the lines of demarkation between the jurisdiction of the courts in this three cornered administered municipality, the legal fur will probably begin to fly in the near future. There may even be international complications.

Gas Industry in Japan

AT the end of 1920 there were 81 companies in all Japan which supplied gas, or gas together with electricity. The total investment in these industries was Y.254,-987,000. They consumed 774,626 tons of coal in 1920, and produced 10,153,169,957 cu. ft. of gas, sold to 493,036 houses.

In 1889 there were only two gas companies in Japan. Their capital paid up was only Y.310,000, and they supplied only 1,049 houses with 91,000,000 cu. ft. of gas. By 1905 the number of companies had increased to seven, in which Y.7,900,000 was invested and they supplied 37,679 houses, with 883,000,000 cu. ft. of gas.

The investments in gas companies increased rapidly after the Russo-Japanese war, and in 1910 there were ten companies operating, capitalized at Y.27,580,-000 paid up, which supplied 117,616 houses with 3,546,-000,000 cu. ft. of gas.



By-Products Works of the Tokyo Gas Co.

Reach Country Districts

From 1910 to 1912 the extension of gas works to small country districts had been greatly developed and in 1912 there were 74 companies in which the total investment was Y.52,630,000, supplying 4,360,000,000 cu. ft. of gas to their consumers.

In 1915, at the end of March, the number of companies had increased to 87, capital invested to Y.80,790,000, and the quantity of gas supplied to 5,327,000,000 cu. ft. The later progress of the industry is shown in the following table:—

Year 1916	No. of companies	Capital Yen	Gas supplied cu. ft. Yen
March 31	91	86,870,000	5,435,000,000
1918	72	109,270,000	7,919,000,000
1919	82	unknown	9,420,000,000
December 31, 1920	81	154,990,000	10,153,000,000

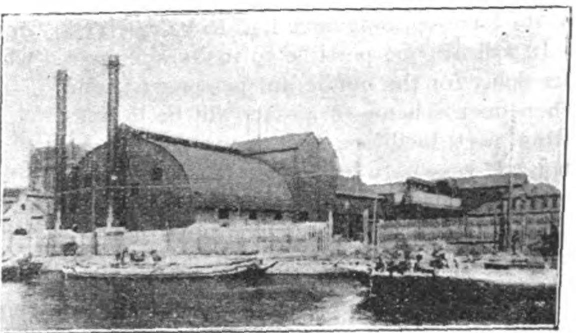
supplying 493,036 houses.

The Nagoya Gas Works

From these figures it can be seen that the expansion of the gas-producing industry has been extraordinary especially from 1908 to 1919.

Used for Power

The end of the Russo-Japanese war witnessed a boom in the promotion of industries and with the rise of new factories all over the country, the demand for gas increased for use in engines. At the same time demand for better lighting grew and gas became more and more popular. Naturally in all the important industrial centres the gas industry expanded, and between the two years 1910 and 1912 the investment in gas companies doubled, while the number of companies producing gas increased 700 per cent.



The Senji Works of the Tokyo Gas Co.

Post-War Projects

Since the Russo-Japanese war (say 1906) the important new gas companies that have been organized are:

Name	Year Organized
Kyoto Gas Co.	November 1909
Nagoya Gas Co.	November 1906
Hiroshima Gas Denki Co.	October 1910
Chosen Gas Co.	October 1910
Bishu Denki Co.	April 1909
Chida Denki Co.	February 1910
Nara Gas Co.	December 1910
Okazaki Gas Co.	April 1910
Shizuoka Gas Co.	June 1910
Akashi Gas Co.	May 1912
Fukuyama Gas Co.	December 1911
Toyohashi Gas Co.	October 1909
Wakayama Gas Co.	April 1911
Sakai Gas Co.	March 1910

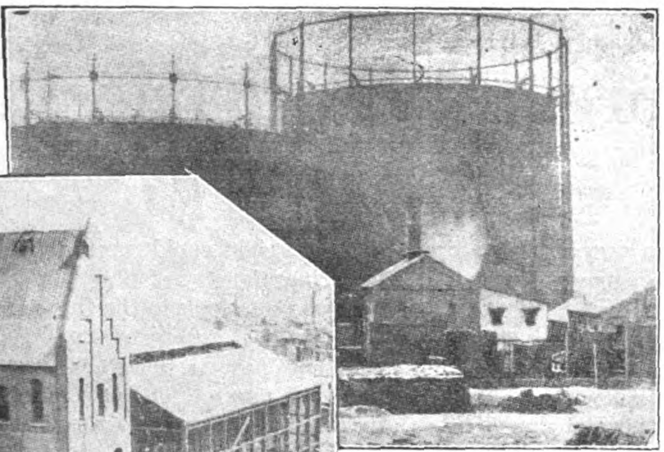
Besides these important companies small scale concerns were established all over the country. At the same time there was a conspicuous expansion of electric light companies. Demand for light was increasing, and another reason was the very profitable showing all the old-established companies had been making for years past.

For instance the Tokio Gas Company, established in 1900, and the Osaka Gas Company, established after the Russo-Japanese war, had always shown net profit of 18-20 per cent. on the money invested. In those times before the European war 18-20 per cent. net profit on paid-up capital was considered a splendid investment return, and naturally that high rate of profit attracted universal attention from the investing classes.

Popular on Market

One of the results of this was to make the shares of the Tokyo Gas Company very popular on the stock exchange, and to place them in the front rank of speculative shares, along with Kanegafuchi Boseki, Tokyo Dento, and the stock exchange shares themselves. And this popularity on the stock exchanges, reacted on the promotion field and made the promotion of gas companies very popular indeed.

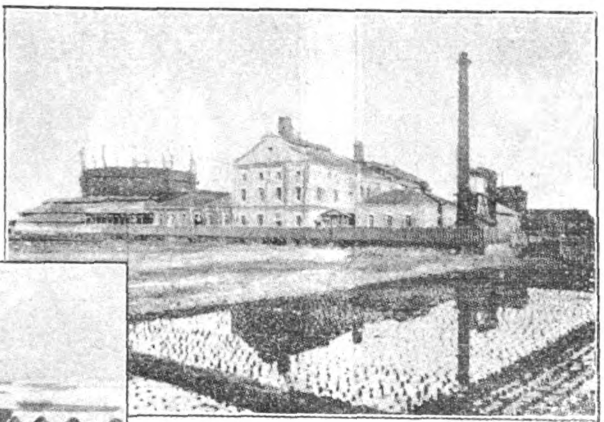
With 1912 the first period of expansion of the industry seems to have come to an end. But after the beginning of the European war a second



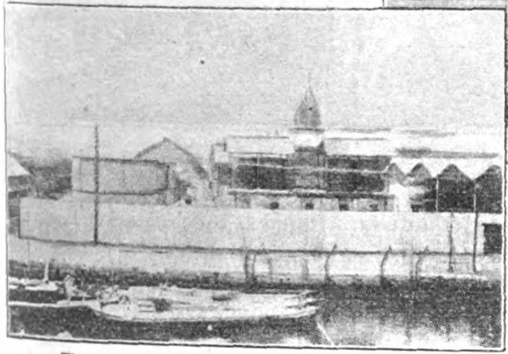
Osaka Gas Tank

Osaka Gas Works

period of expansion set in, while new companies were again promoted. But with the war the price of coal began to advance and this made the industry more difficult to operate at a profit. Before the war coal was



The Fukugawa Works of the Tokyo Gas Co.



The Shiba Works of the Tokyo Gas Co.

usually Y.50 per 10,000 *kin* (13,333-lb.), but in 1917 it rose to Y.160 and in 1919 it was Y.230,240. During and after the Russo-Japanese war the price of coal rose 60 per cent., but during the European war it rose 200 and even 300 per cent. in price.

Gas companies are public service corporations, and most of them had contracts with municipalities, and country districts for selling certain fixed amounts of gas for long periods at a fixed price. Naturally these contract prices could not be increased. So newly established companies without any reserves, found themselves in difficulties from which they were unable to extricate themselves. While the old established companies were much upset, they were able to go on existing from the sale of their by-products, which were selling at enormously high prices.

Reforms at Osaka

Recently the charges made by the Tokyo Gas Company and the Osaka Gas Company, have been the targets for attacks demanding reforms. These companies had city contracts, and in Osaka in order to get permission to raise the price of gas to Y.3.00 per 1,000 cu. ft. the company was obliged to submit to certain conditions imposed upon its future operations. The number of houses supplied must be increased 500 monthly: the amount of gas mains laid must be increased in proportion and from September 1 no charge for metres was permitted.

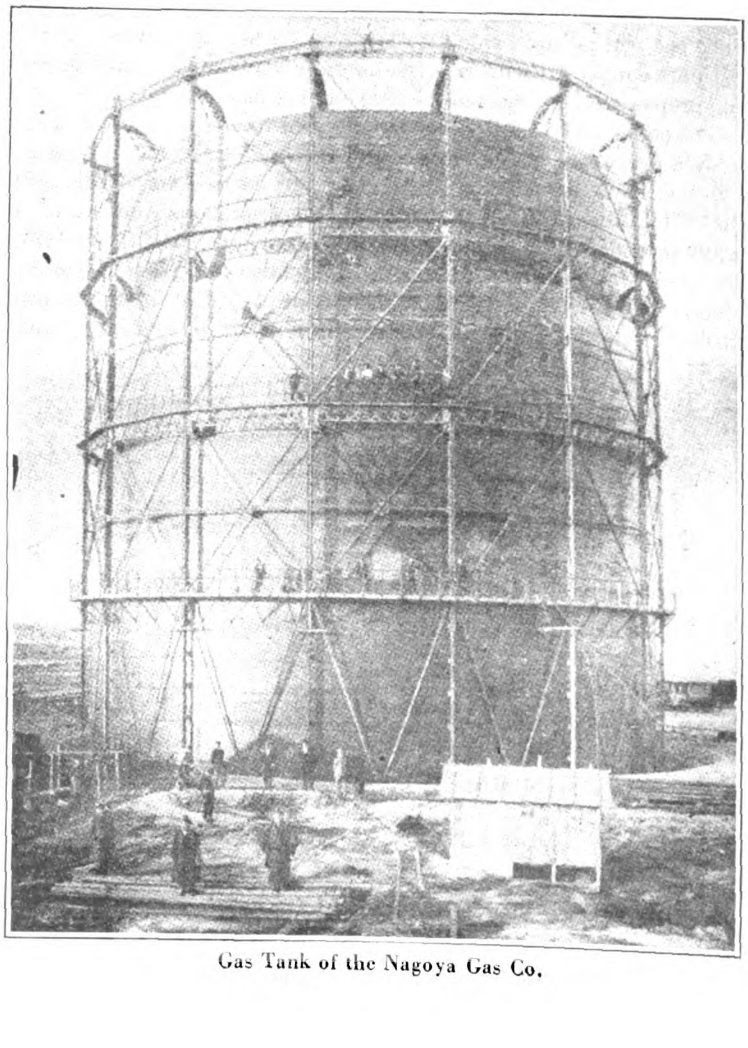
As the cost of coal decreases gas companies naturally must decrease their charges. But if the cost of coal rises, then their incomes will decrease, and they will be obliged to raise their charge again. If present contracts with the municipalities are not subject to cost changes with the rises and falls in the price of coal, the gas companies will probably find themselves hard hit at some not distant time, if the wishes of the coal companies can be realized.

From one point of view Japan's gas industry seems to have reached its topmost height. Of course, hereafter demand will increase, and supply will also increase, but the rate of increase will not be very great nor very fast. Sooner or later the extension of the electric light companies, and power companies will react on the gas companies and their profits will fall. Then there will come a shifting of capital to electric enterprises now actually going on.

Automotive Development

The Tsing Pei or Northern Shansi Automobile Transportation Company is being organized at Taiyuanfu with a capital of $20,000.

Mr. Wang Chi-liang is promoting an automobile transportation company at Hankow to operate a service on the outskirts of the city.



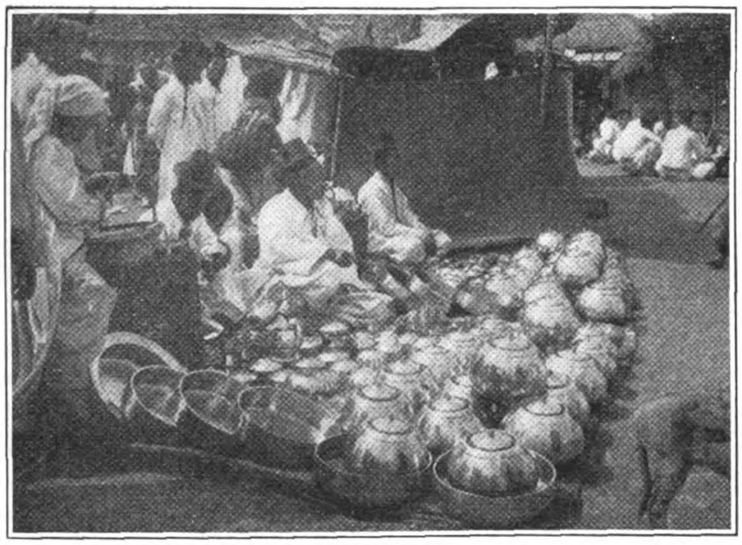
Gas Tank of the Nagoya Gas Co.

Korean Industries

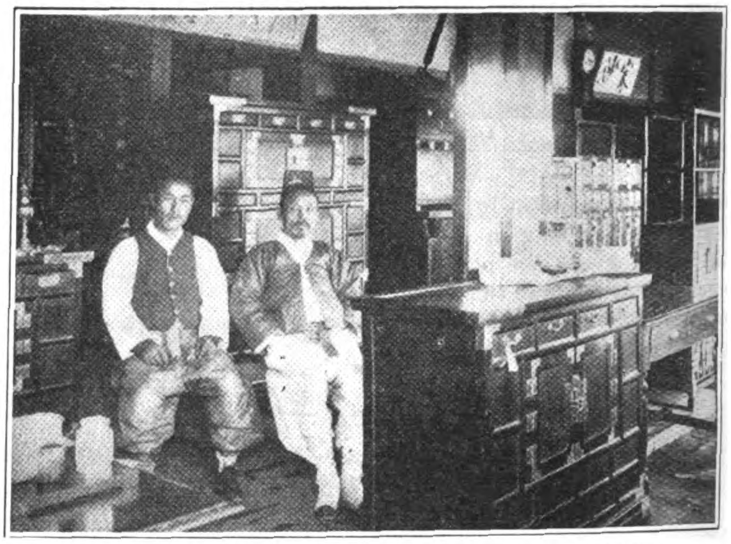
By T. Hoshino

KOREAN industries are mostly of a very crude nature, some being hardly worthy of the name, requiring neither a large capital nor great technical skill. This state of affairs will continue for a considerable time yet, seeing that the articles requiring either or both of these for their manufacture can be imported from Japan with advantage, unless there are special reasons in favor of their being made here. Hence the works that came into being in earlier days were for the most part connected with rice-cleaning, smelting of ores, cotton ginning, preparation of tobacco, brewing and the production of salt. To some of these one would grudge the name of manufactures, as being simply a process in the preparation of raw materials, but they may be termed manufactures in that they are carried on in distinct mills or factories, by persons who are not producers, and are conducted more or less on the lines of the modern factory system. Even these rough kinds of manufacture, however, present plenty of scope for development, since, for example, most minerals are exported in the form of ores whereas, if smelted here, a large part of their freight could profitably be saved. In short, the manufacturing industry of Chosen is only just out of its primitive stage, and we must look to the future for its great development.

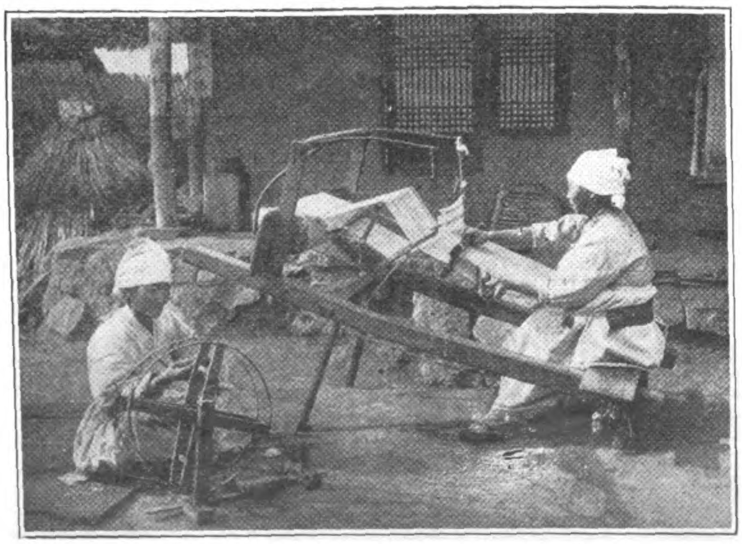
Growth of Factory System.—As in the case of most new countries, of which Chosen is one when speaking economically, a feature in the economic progress of the peninsula is the passing over of many of the intermediate stages through which one system has developed into another in older countries. Rapid as the progress of Japan has been, it has not been half so sudden as in the case of Chosen. For instance, in the silk industry, many stages were passed through in Japan before it reached the present factory system. The domestic system was long in vogue there, during which many homes were provided with hand-reeling machines, and the cocoons they produced were made into silk before appearing on the market, or else the cocoons to be reeled were given out by entrepreneurs to their employees who did the work in their own homes. But in Chosen, all such intermediate stages have been skipped over. It is but a few years ago since cocoons began to figure in the list of



Korean Brasswork is Famous for its Excellence

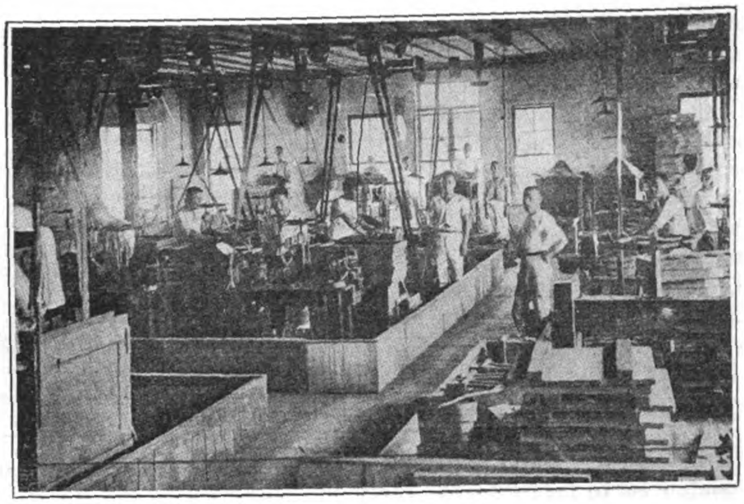


The Korean Chest is Prized as a Work of Art and Utility



77,000,000 yards of Cotton Cloth are Woven each Year by the Patient Women of Korea

A Korean Pottery Market



The Toa Tobacco and Cigarette Factory at Seoul, now Operated by the Government Monopoly Bureau

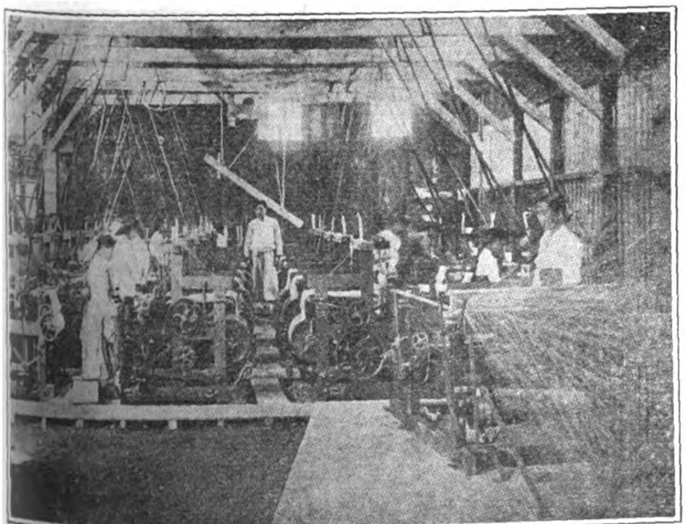
exports, and already we have here silk factories as well equipped as any in Japan, though on a very small scale. Thus many processes for preparing raw materials which are performed in individual homes in Japan are done in Chosen in factories, with the result that factories have increased very rapidly in recent years, as shown in the following table:—

Year	Number of Factories	Capital	Motive Power: Number of Engines	Motive Power: Horse Power	Value of Products
		Yen			Yen
1911	252	10,613,830	148	6,058	19,639,655
1912	328	13,121,481	205	8,069	29,362,307
1913	532	17,478,146	319	9,908	36,066,172
1914	654	17,371,832	319	13,278	32,754,797
1915	782	21,113,607	405	16,252	45,931,133
1916	1,075	24,613,500	459	17,460	59,026,639
1917	1,358	39,038,966	619	26,170	98,972,187
1918	1,700	48,309,485	714	26,151	156,801,630

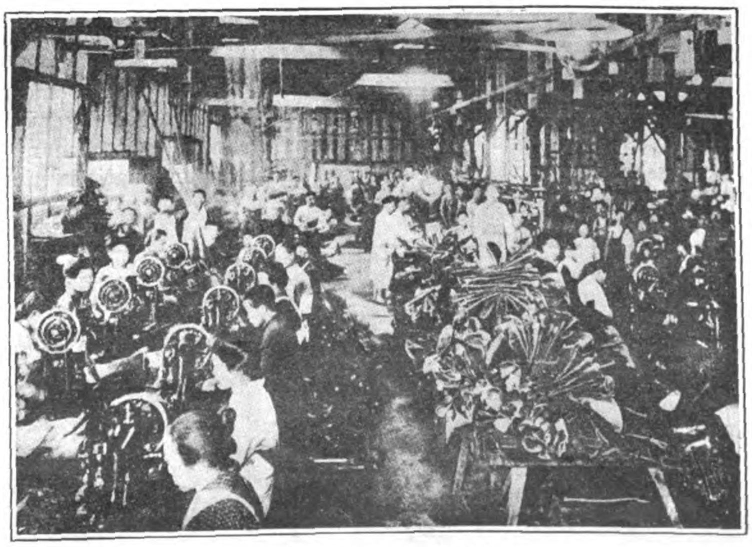
Thus it is seen that during the past seven years the number of factories has increased by more than 575 per cent., capital by about 355 per cent., and the value of production by 698 per cent.

Korean Manufactures Classified.—The following table gives the various kinds of manufactures, the number of factories for each, the amount of capital invested, and their production according to the statistics for 1917, also the nationalities of those engaged in their manufacture:—

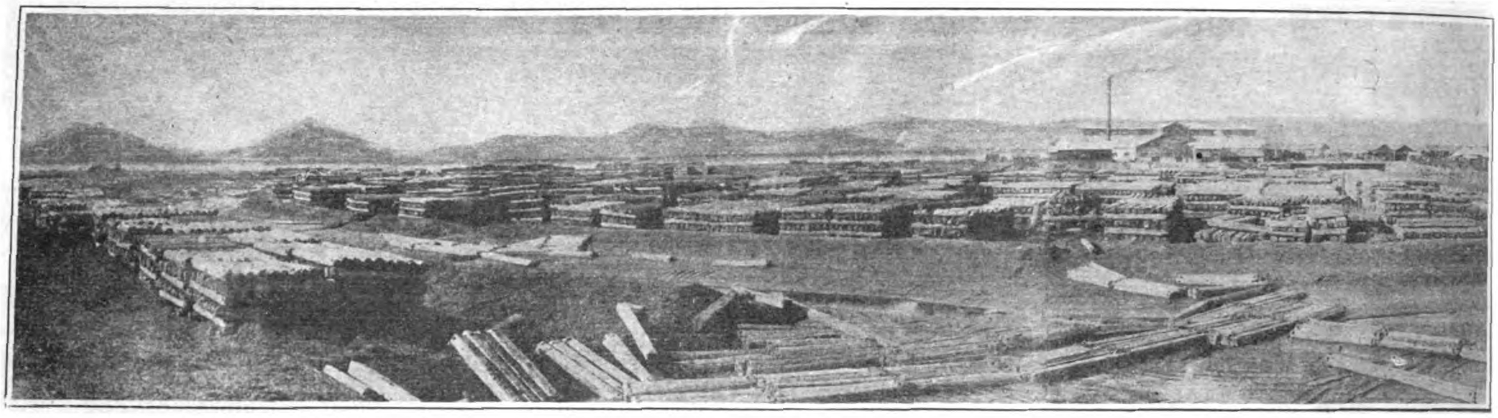
	Nationality of Owners	No. of Factories	Capital	Value of Products
			Yen	Yen
Dyeing and Weaving	Japanese ...	15	99,750	117,579
	Koreans ...	68	221,390	511,975
	Total ...	83	321,140	629,514
Spinning	Japanese ...	2	43,000	40,125
Cotton ginning	Japanese ...	19	6,752,239	6,073,075
	Koreans ...	2	15,000	100,098
	Total ...	21	6,767,239	6,143,173
Pulp	Japanese ...	1	?	129,600
Paper	Japanese ...	3	15,000	14,516
	Koreans ...	51	15,886	58,022
	Total ...	54	30,886	72,538
Tanning	Japanese ...	8	1,991,036	3,531,663
	Koreans ...	37	52,900	229,193
	Total ...	45	2,043,936	3,760,802
Ceramics...	Japanese ...	67	506,500	631,944
	Koreans ...	115	137,720	169,350
	Total ...	182	644,220	801,294
Soap	Japanese ...	10	117,700	169,178
Candles	Japanese ...	4	29,500	301,000
Matches	Japanese ...	1	7,000	30,000
Dye-stuffs	Japanese ...	1	40,000	98,437
Artificial manures	Japanese ...	4	280,000	165,012
Metal ware	Japanese ...	57	279,270	1,590,729
	Koreans ...	106	202,250	378,695
	Total ...	163	481,520	1,969,424
Carpentery	Japanese ...	14	81,510	102,636
	Koreans ...	19	32,867	76,656
	Total ...	33	114,377	179,292
Lumber	Japanese ...	16	396,000	1,130,195
Shipbuilding	Japanese ...	8	54,500	90,779
Rice-cleaning	Japanese ...	143	3,549,766	41,517,861
	Koreans ...	154	546,420	5,855,153
	Total ...	297	4,096,186	47,373,014
Flour milling	Japanese ...	9	133,140	168,062
	Chinese ...	1	500	4,500
	Total ...	10	133,640	172,562



Matting Factory, Seoul



Tannery, near Seoul

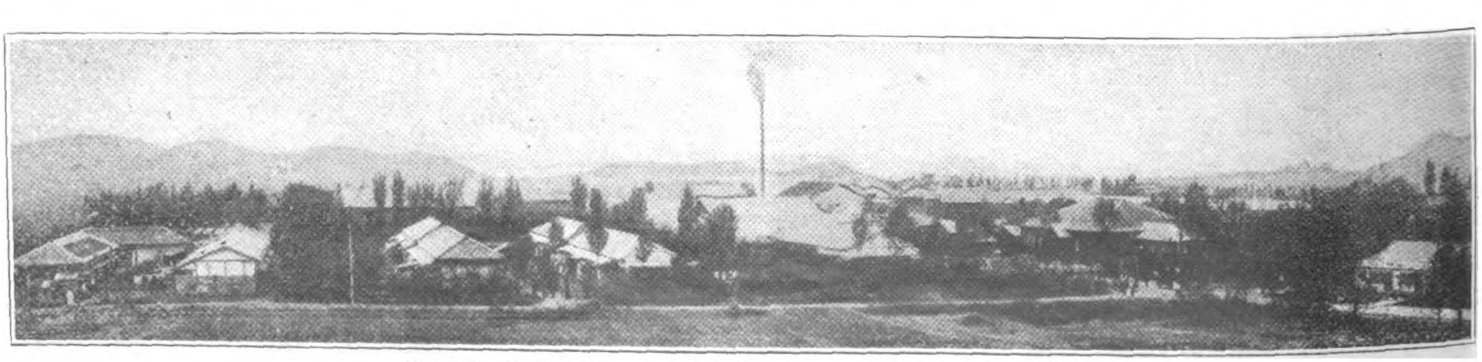


Government Saw Mill and Lumber Yard, Shin-gishu

	Nationality of Owners	No. of Factories	Capital	Value of Products
			Yen	Yen
Tobacco ...	Japanese ...	21	2,214,413	6,016,332
	Koreans ...	5	211,880	539,627
	Total ...	26	2,426,293	6,555,959
Brewing ...	Japanese ...	108	1,968,485	1,835,318
	Koreans ...	6	101,000	97,216
	Chinese ...	3	23,000	53,363
	Total ...	117	2,092,485	1,985,897
Salt ...	Japanese ...	15	398,150	676,773
Canning ...	Japanese ...	23	301,631	450,543
Printing ...	Japanese ...	59	617,965	1,400,014
	Koreans ...	11	103,110	65,540
	Total ...	70	721,075	1,465,560
Tailoring ...	Japanese ...	12	91,050	341,950
	Koreans ...	22	214,150	248,528
	Total ...	34	305,200	590,478
Smelting of ores ...	Japanese ...	26	8,832,555	14,801,381
	Koreans ...	2	15,000	10,330
	Foreigners	7	2,207,582	5,975,230
	Total ...	35	11,055,137	20,786,941
Gas and electricity ...	Japanese ...	17	4,402,548	2,176,297
	Jap. & Kor.	3	384,733	134,769
	Foreigners	1	850,000	14,442
	Total ...	21	5,637,281	2,325,508
Others ...	Japanese ...	73	457,650	800,626
	Koreans ...	7	13,220	23,418
	Jap. & Kor.	1	25,000	22,000
	Chinese ...	1	5,000	2,545
	Total ...	82	500,870	848,589
Total ...	Japanese ...	736	33,660,358	84,401,585
	Koreans ...	605	1,882,793	8,363,753
	Jap. & Kor.	4	409,733	156,769
	Chinese ...	5	28,500	60,408
	Foreigners	8	3,057,582	5,989,672
	Total ...	1,358	39,038,966	98,972,187

It will be seen from the above table that, in the amount of capital invested, the smelting of ores occupies the foremost place with Y. 11,055,137, and is followed by cotton ginning with Y. 6,767,239, and by gas and electricity, rice-cleaning, tobacco manufacturing, brewing and tanning in order, while as regards nationalities Japanese play by far the most important part, providing 86 per cent. of the capital and turning out 85 per cent. of the total value of production. The inactivity of the natives in the manufacturing field is regrettable, but they, too, are awakening, and it will not be long before they figure very largely in this new phase of economic activity.

Native Industries.—Of the native industries, in which the Koreans made considerable progress at one time, what now remain are weaving, ceramics, paper-making, brewing, metal working and a few others. The weaving of cotton is mostly carried on by the country women at home, yet its production during 1917 is estimated to have reached 3,400,000 pieces (76,613,000 yards). Recently small factories have sprung up for the carrying on of this work on a larger scale. Silk weaving is also carried on in some localities, but its annual production hardly exceeds 210,000 pieces (4,732,000 yards). Hemp-weaving is only next in importance to that of cotton, and its annual production is considered to be about 2,600,000 pieces. The statistics for 1916 show that the total production of cotton tissue in that year amounted to Y. 3,630,000 in value, that of hemp cloth to Y. 3,670,000, that of silk to Y. 740,000 and that of mixed tissue to Y. 60,000. The art of ceramics in which the Koreans once exhibited great skill has long died out. But the revival of this lost art seems dawning, as is shown by the fact that some Koreans have already established factories on a fairly large scale for this purpose, of which the most noted is the Pyengyang Porcelain Factory. The report for 1916 puts the total production of earthenwares, porcelain and unglazed pottery in that year at Y. 850,000, glass wares at Y. 70,000, earthen pipes and bricks Y. 640,000 and lime at Y. 60,000. The manufacture of native paper has survived modern mills, the Korean paper having a peculiarity of its own which the primitive method they employ alone can give. The annual production amounts to Y. 1,500,000 of which about Y. 100,000 is exported to China. Metal working has been extensively conducted in Korea since very early times, brass utensils being very largely used in the Korean household. They still exhibit considerable skill in this art. Brewing is also extensively carried on and the total quantity of liquors produced is estimated at about 40,000,000 gallons. Among other native



Tannery of the Chosen Leather Company at Eitiho, Keiki Province

industries, the manufacture of *wangol* goods is very promising, the *wangol* being a kind of reed peculiar to Chosen, growing in marshy places, with which the farmers made matting from early times. Of late, various articles, baskets, hats and fancy goods, are being made of it, and in 1916 the total production amounted to Y.490,000 in value. On the whole, it may be said that the native arts and industries are being fostered with the utmost care and have made some progress. But the real progress is seen in the new type of manufacture introduced by the Japanese and conducted on the factory system of which a brief description is given below.

New Industries.—A feature of the new industry is, as we have observed before, its being conducted according to the factory system, and that its products are intended rather for export than for home consumption. The great majority of the Korean people, considerably advanced as they are in their standard of living as compared with some years ago, need but few things besides what they make by their own hands, and the Japanese and foreigners in the land are yet too few to need to retain much for their own use. The result is that a great part of what is produced by the new industry, as we call it, is exported abroad. There are, of course, some exceptions, the notable one being tobacco, the greater part of which article is consumed in the country. Yet, even in this case, the export of cigarettes to China is increasing yearly. Another feature is that it is almost exclusively undertaken by Japanese. A glance at the foregoing table of Korean manufactures classified will convince the reader of this fact. This is but natural, seeing that the Japanese are the richer and more enterprising of the two predominating populations of the country, and especially in view of the fact that the destination of the articles manufactured is mostly Japan.

The more important of these new industries are listed in the same table quoted above, the principal ones being smelting of ores, cotton ginning, gas and electricity, rice-cleaning, tobacco manufacture, brewing, tanning, salt manufacture, etc. There are still others which do not appear in the list at all, or, if they do appear, the figures relative thereto are very insignificant, and yet they are of paramount importance on account of the great future they are considered to have in store. These are the manufacture of flour, sugar, pulp, cement, porcelain and matches, and spinning.

Below we give a general survey of the manufacturing enterprises in the peninsula.

Iron works on an extensive scale have just been founded in the Peninsula by the Mitsubishi firm at Kyumipo in Whanghai province. When completed it is estimated the foundry will produce 100,000 tons of pig iron, 62,000 tons of ingot iron and 73,000 tons of iron plates, bars, etc., together with a large amount of by-products. The supply of ores to the foundry is to be drawn from the company's own mines, six in number and covering an area of 10,000,000 *tsubo* (8,169 acres) altogether, and from other mines in the neighborhood. These and other works in this line are considered to be highly promising on account of the plentiful supply of materials. The manufacture of pulp was begun some six years ago by a Japanese who made use of reeds as material, but it is only recently that public attention has been called to this important industry by the establishment of a large joint-stock company in Shinwiju with a capital of Y. 5,000,000. The famous Yalu timber will be made use of as material, and when the factory is in working order it is expected to turn out about 30 tons of pulp daily, or about 10,000 tons a year. The growth in the manufacture of pulp will, it is considered, further encourage the manufacture of paper, for which the country has been famous from of old. Tanning is considered one of the most hopeful industries in Chosen on account of the presence of hides of excellent quality in large numbers. One large tanning company was established in 1911 at Yung-dung-po with a capital of Y. 1,000,000, and this has since been engaged in the making of leather belting, sole-leather, harness leather, box calf, etc., by the process of oak and chrome tanning. The company received large orders for military boots and cartridge pouches from the Russian government during the European war, which at one time amounted to quite considerable figures. Cotton spinning and silk manufacture have also a good prospect because of the increase in cotton growing and in sericulture. Great hope is also entertained as to the future of the tobacco industry since the annual consumption of tobacco in the peninsula amounts to Y. 6,000,000. The largest tobacco factory is the Toa Tobacco Factory in Seoul with branch factories in Pyengyang and Chunju. The output of this company has not only succeeded in ousting the imported cigarettes from Japan and Shanghai, which until quite recently monopolized the Korean markets, but is exported in goodly amounts to Manchuria. The manufacture of sugar is also considered very hopeful. Experiments have shown that the sugar-beet grows excellently in Chosen, and an attempt at the establishment of a sugar factory was made in 1912, which, however, failed to be carried through. Recently a large sugar factory has been established in Pyengyang with a capital of Y. 5,000,000 by Japanese and Koreans jointly. If it succeeds, Chosen will have another important branch added to her industry. Enterprises of various other kinds, notably in chemicals, are being contemplated, some are under promotion, and some are already organized. Such are the manufacture of soda, for which the cheap Korean salt obtained by the process of spontaneous evaporation is available as material, the manufacture of oils and fats for which the country furnishes plenty of material in the form of fish and vegetable oils, of pottery by making use of the abundant kaolinite found in the peninsula, and of glass, in the making of which the native siliceous sand is to be used.

Government Enterprises.—The government of Chosen conducts several industrial enterprises such as the manufacture of briquets by the Pyengyang coal mining station, the saw mill attached to the lumber station in Shinwiju printing at the printing bureau in Yongsan and the manufacture of salt by the salt-manufacturing station at Kwangyangman and Chooan. Of these, the first two items have already been touched upon in the preceding chapter under the headings of mining and forestry respectively. Printing, the third, is too trivial in character to be dealt with at any length in such a work as this. Suffice it to say that, besides the government documents largely printed by the bureau, the Bank of Chosen notes, circulating at this time to the amount of over Y. 150,000,000 in Chosen and Manchuria, are also printed by it. The fourth, that is the manufacture of salt, needs some description because of its being one of the principal items of the manufacturing industry of Chosen.

The government salt-pans for natural evaporation at Kwangyangman and Chooan covering in all 2,526 acres, were completed in 1913 and have ever since been supplying the peninsula with this much needed commodity. The following table gives the area of the basins, their yield, and the receipts during the last nine years:—

Year	Area of Salt Basins Acres	Quantity Produced Pounds	Quantity Sold Pounds	Value Yen
1910	219	1,317,804	1,357,758	4,606
1911	1,415	5,966,390	3,477,249	18,382
1912	2,334	19,818,118	14,977,687	73,758
1913	2,526	56,201,622	20,783,937	63,104
1914	2,526	64,457,793	48,222,928	104,171
1915	2,526	68,581,186	69,679,614	222,868
1916	2,526	94,414,550	58,678,008	197,706
1917	2,528	117,182,683	?	?
1918	2,528	102,396,141	?	?

It is to be noted that, in spite of the progress made by the government salt-pans, they are hardly yet in a position to supply even half the demand for salt in the peninsula, which demand is rapidly growing, making it necessary to import a great amount of foreign salt. The total amount of imported salt in the fiscal year 1918 reached over 376,425,000 pounds, valued at Y. 1,502,000, which shows an increase of 84,092,478 pounds, valued at about Y. 500,000, over the preceding year. Among the different kinds of imported salt, Chinese evaporated salt coming from Shantung led the rest in 1918, amounting to 328,367,552 pounds in quantity.

Modern Progress in the Province of Fukien

By Rev. J. E. Walker

WHEN the empress-dowager inaugurated her plans for a general system of modern education, Foochow city responded promptly, as did in greater or less degree all other cities on the Min River. Buildings for the various schools were erected or remodeled in Western style on a liberal scale, and schools of the several grades were opened. Various influences had prepared the way for this; and not the least were the three mission "colleges" at Foochow. A start in teaching of English and Western sciences had been made by the Anglo-Chinese College as far back as 1881. This was located in Nantai, the foreign settlement, three miles south of Foochow city. Not long after a mission school in the city also took on these branches, though on a smaller scale; and the two reached a larger constituency than would the more distant one alone have done. St. Mark's College, though the third one to take up these branches is now doing so on a large scale. The three have drawn in students from the whole province, especially the northern and central parts. Quite a number of graduates from these schools have pursued further studies abroad, and are now filling various positions at home as professors, doctors and in official positions. Two years ago two Americans were at a little feast given by returned students. Dainty Chinese courses in elegant Chinese dishes were partaken of with chop-sticks; but the lively conversation was carried on in faultless, fluent English.

At the present time the province is divided between north and south along the line of the Min River. Foochow, and everything north of this river is under the north, and everything south is under the southern government. This hinders progress very much.

Among other enterprises was a modern hospital well housed in a two story brick building, and fairly well equipped. Dr. Margaret Ling was put in charge of it. She was the daughter of a former Foochow pastor, had graduated from the Foochow College, and then had gone to America where in due time she graduated from Chicago Medical School which is connected with the Illinois State University, and was well qualified for the position. But mismanagement of funds wrecked the institution; and it was closed about a year and a half ago. An offending manager committed suicide.

One remarkable advance at Foochow has been the opening of the horse road from the end of the Long Bridge (Wan-shou Ch'iao) to the city, and on into the heart of the city. This shows how thoroughly the old bondage to "*Feng Shuei*" is broken. The South Gate was the dragon's mouth, and the white pagoda on the east and the black pagoda on the west were the dragon's horns. The ground in and about the South Gate was so low that in case of a flood in the river it would be overflowed to a depth of one to five or even to ten feet.

The horse road was begun in the fourth year of the republic and was finished in the seventh. It first turned east from the head of the Long Bridge till it reached the outside of the suburbs, then pursued a general northerly course for about two miles, then turned west till it reached the Water Gate by which it entered the city.

From this point it was extended into various parts of the city. It was finished in the seventh year of the republic, was soon well supplied with jinrikshas, and much patronized by the well-to-do. But all foot travel between the city, the south suburbs and the foreign community went by the shorter South Street; and then this also was opened to the horse road. A gap was made right through the city wall on the east side of the South Gate, the low ground in and about which was filled up till the gate was closed to all travel. The shops facing on the street retracted their fronts to make a street wide enough for three autos to go abreast; and now horse carriages and autobusses dash along the once sacred South Street. The jinrikshas also run out through the West Gate up to the Upper Bridge (Yun-shan-ch'iao); and in time they will be running down the river to the anchorage.

There is talk of a highway to extend clear across the province to the head waters of the Min, and then from there over the divide into the Kiangsi province. This will come when the country is united again under one good government. The influence of the waterworks, electric lighting and widened streets is felt all through the Min valley; and beginnings along these lines have appeared at various points in the interior. The whole province is rich in water power, now all running to waste. But the old superstitions are breaking down; and the people are ready. All now waits on capital; and capital waits for confidence in an established government acceptable to the people.

Min River conservancy is an enterprise which aims to provide a thirteen-foot channel from the anchorage to the bund of the foreign settlement on Nantai Island, distance of nine or ten miles. Work was begun nearly three years ago and much has been accomplished. A large capital was borrowed to begin with, and a large yearly income provided for through a surtax on shipping and goods from both the maritime and native customs. For the second year ending February 28, 1921, the sum derived from these sources was $110,659.30. According to the report issued for the second year by the conservancy executive committee, it began with $688,436.58 and closed with $674,336.51 balance on hand.

New shore is built up by means of bamboo and broken stone dykes; and in the course of a year or two the banks attain a sufficient height to warrant their being faced with broken stone, and thus rendered permanent. The stone is taken from a quarry conveniently located on Kushan Point about midway between the two termini. A flood of unusual violence beginning June 26, 1920, severely tested the strength of the work as so far carried on, with but little damage resulting. Foochow's supply of bamboos comes mainly from a region on the Yung-fuh river; and banditi at times hinder the prompt and full supply of bamboos. The conservancy commission had purchased the site of the quarry as government property; but as soon as they began work, several parties from a near-by village claimed ownership of part of the site, but were content with contracts for quarrying the stone from their own sites at the same prices as the original contractor. At the start river boats and boatmen were hired to deliver the broken stone; but they made so much hinderance with strikes, etc., that the commission had ten pontoons built; and now for the past year the work has been going steadily forward with increasing rapidity.

The executive committee consists of Mr. Ling Ping-chang, Chinese delegate; Mr. G. C. Hanson, American consul, representative of the consular body; Mr. Percy R. Walsham, commissioner of customs, honorary secretary and treasurer; Mr. H. von Heidenstam, royal Swedish corp of engineers, consulting engineer; Mr. J. R. West, M. AM. SOC. C.E.E., engineer-in-chief. The secretariat and official staff consists of Mr. S. T. Polk, assistant secretary, and four Chinese; and there is a technical staff, consisting of Mr. J. G. Grant, superintendent of works, and fourteen Chinese, surveyor, draftsmen, cadet engineers, overseers, etc.

The government has opened a number of trade schools; also two schools of agriculture, one for young men and one for young women. There are also primary, higher primary and middle schools with a large enrolment of students: also a commercial school, a mining school, a foreign language college, a normal school, boys and one for girls; also here and there kindergarten schools. But it is with great difficulty that the schools are kept going for lack of money. A union college of the three missions has a little over 100 students.

At Amoy Mr. Tan Kak-hee has given millions for the founding of an university; and Mr. Lim Boon-king of Singapore has been elected president.

The most important thing, and one that does not appear on the surface is the changed attitude of the Foochow gentry toward everything Western. There is this "the promise and potency" of yet greater things to come.

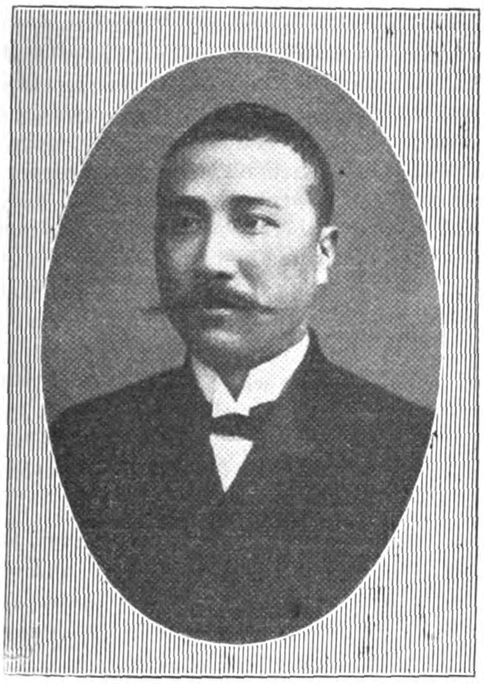
Commission Government in Canton

By Orrin Keith

THE cities of China have from time immemorial been administered by the authorities of the province in which they were situated. They were merely a part of the province. Such a thing as a municipality was unknown. The governing of a huge city, like the administration of justice or the command of an army, was considered to be entirely within the competence of the classically educated mandarin.

Students of political science returning from America brought the information that in that country city administration was considered a highly specialized study; that men devoted as much time and labor to the understanding of the problems of municipal administration alone as the scholars of old gave to their whole series of degrees. City problems were not a mere phase of provincial organization. They required separate treatment and separate organs of administration. In short, city government was in a sphere of its own and should be removed entirely from the control of the provincial authorities.

This line of reasoning, however, had no attraction for the members of the mandarinate. The provincial governors realized full well that the largest share of their revenues came from the large cities in their provinces. They were not minded to give up these revenues to humor the whims of Western knowledge and to furnish material upon which returned students might try experiments with results which no one could foresee. If the ordinary mandarins refused to sacrifice cash returns for the advancement of political science in China, it was hardly to be expected that the anamolous individuals known as tuchuns would be more favorable inclined. Not for a moment! Cities existed to furnish money, not to be well governed.



General Chen Chiung-ming, Governor of Canton.

Wu Ting-fang, the veteran diplomat, now directing the Foreign Affairs of the Canton Government.

In the South, however, was found a tuchun of another mould. As soon as General Chen Chiung-ming had succeeded in driving out of Canton the defeated armies of the Kwangsi militarist party and had re-established parliamentary government in Kwangtung, he gave ear to the suggestions of a young man who had devoted his years of study in America to the science of municipal government. This young man was Sun Fo, son of Sun Yat-sen. He had pursued his studies first at the University of California and then at Columbia. He was filled with the desire to see his city of Canton placed under a modern administration and he pled with the governor to grant the city a charter.

The governor complied with his wish and Sun Fo and several of his associates set to work upon the draft of a charter. There were many problems to be dealt with which had never come up in connection with American cities so that some originality was demanded. The new charter could not be a mere copy of selected provisions from American documents. It was soon completed, however, and presented to the governor for his action. On December 23, 1920, Governor Chen promulgated the provisional charter of the city of Canton, the first municipal charter in China.

The document is an admirable example of brevity in state papers. It fills but eight printed pages and its logical order and clear definition are equally commendable. It is a tribute to the training of its author. In another point it is a departure from the precedent of Oriental constitutions. The ultimate control being frankly retained in the hands of the civil governor, there is no attempt to hide or disguise the fact. The people of Canton have had no experience in electing officials nor in administering their own affairs and the provisional charter gives them an opportunity to take over these responsibilities gradually.

The first unusual problem which presented itself was to determine what was the city of Canton. The old system required no line of demarkation between the city and the surrounding country so the city had no recognized boundaries. The first chapter of the charter therefore provides for a city boundary Commission which shall define and fix the area and boundaries of the city. This commission is appointed by the civil governor so that there will be no undue encroachment on the province. After the boundaries are fixed, the city may extend its area with the consent of the civil governor but no territory once included within the city can be separated and establish itself as a separate municidality. The area thus determined is declared a loacl government directly under the provincial government and independent of the hsien administrations.

The sphere of municipal activities is a large one and includes practically everything which pertains to city government in America. Finance, highways, sewers, public health and amusement, public safety and fire prevention, education charity, communication, transportation, water, gas, and light, city properties, a city census, are especially listed as among the functions of the new government. In addition other matters and affairs may be assigned to it by the central and provincial governments.

The powers of the new government are exercised by a commission of seven known as the municipal executive council. This council consists of the mayor and the commissioners of the six established departments: Finance, public works, public safety, public health, public utilities, and education. The council governs its own

proceedings, and its action upon any question within its jurisdiction is apparently final, even the civil governor being powerless to interfere.

It is the intention ultimately to have the mayor elected by the people of the city. For the first term of five years, however, and until the people have some experience in electing civic officials as provided elsewhere in the charter, the mayor is appointed by the civil governor. Quite appropriately General Chen conferred this appointment upon Sun Fo, not because he was the son of President Sun, but because he was the man obviously qualified to fill the position.

The commissioners are appointed by the civil governor upon the recommendation of the mayor. The first commission is composed entirely of returned students who have made municipal administration their specialty in the universities of other countries. Three, beside the mayor, are from America, two are from Japan, and one from France.

The department of finance has charge both of the assessing and the levying of taxes, the control of city properties, the management of municipal loans, and the general collection and payment of city funds. There are at present no loans in existence though one, a large one, is contemplated in connection with the plans for the extensive development of Canton as a sea-port and the building of miles of wharf for ocean-going vessels.

The public works department has charge of the laying out of new city streets and the widening of old, a work in which Canton is busily engaged at the present time. It directs the construction and repairing of streets, bridges, sewers and conduits. Of the latter there are none as yet, but their construction is a necessity before Canton can become in any real sense a modern city. The regulation of building and the supervision of parks and public buildings are also functions of this department. Building regulation is of greatest importance in burned over areas, as the city insists that these areas shall be rebuilt, not as they were, but in accord with the demands of modern efficiency and sanitation. This means streets as differentiated from narrow alleys and requires endless diplomatic negotiation with heads of families whose personal interest for the moment renders them none too sympathetic toward the new order of things.

The department of public safety controls the police, of whom there are about 4,000, and the fire brigade, of which there are about 100 members! Order is fairly well preserved in Canton and even traffic is much better regulated than in most Chinese cities. The officers direct the traffic instead of being directed by it as in Peking. Fire protection, however, is entirely inadequate. The neagre city fire force is supplemented to some extent by the efforte of volunteer guild and hong companies but the frequent conflagrations are sufficient evidence that this is one of the functions of the municipality which will require early attention. The fires are not only frequent but disastrous. Acres of buildings go down almost every time. It has one compensation. It hastens the widening of the streets and the modernization of the city. But pursued for this end alone, the method is a drastic one. The department of public safety is also authorized to organize a "Citizen's Volunteer Corps," but just what is intended here is not so clear. No attempt has been made in this line as yet. The department is also charged with the suppression of illegal and disorderly businesses.

The department of public health is expected to attend to the cleaning of the streets—no small undertaking in the unrenovated portions of the city. It regulated the markets, slaughter-houses, baths, restaurants, saloons, theaters, and public latrines. It registers births, deaths, and marriages and has charge of the city census, a matter which cannot progress very far, at least in securing the total number of the population, until the boundaries of the city are fixed. Medical practitioners, dryg stores, and hospitals come within its jurisdiction. A foreign diploma is sufficient to permit the holder to practise the healing art. Also those native practitioners who are over 40 years of age and have practiced for ten years are permitted to continue. All others, however, must take an examination based upon a required course of study. As both the course and the examination are determined by a board of the old practitioners, it may be assumed that the number of native practitioners, now about 1,500, will not increase with undue acceleration.

The department of public utilities is charged with the management and regulation of tramways, gas, electricity, and telephone service. Its jurisdiction extends to the regulation of motor-cars, rickshaws, sedan-chair, ferry-boats, etc. Rickshaws in Canton are all owned by large companies. Ten of these companies are operating at present. Each rickshaw is taxed by the city $100 a year. The companies pay this tax and rent the rickshaw to the coolies who in turn must pay a rental of $16.50 a month, or nearly 55 cents a day. One coolie usually works during the day and then sublets the rickshaw to another for the night at 25 or 30 cents. Private motor-cars pay $80 a year and public or rental cars, $100 to $120 according to size.

The department of education includes beside the control of the city schools, the supervision of private schools, the regulation of theatres and other public places of amusement, the promotion and supervision of private charities, and a measure of responsibility for the maintenance of a poor house, a blind school and a leper hospital which are under the immediate management of the Catholic mission. One-fifth of the municipal budget has been appropriated for purposes of education. This amounts, however, to but little over half a million dollars or about two dollars per year for each child of school age. Its significance lies in the fact that it is larger than the amount spent in the entire province until the present *régime*. The municipality maintains 61 schools. There are 41 primary schools, 17 higher primary schools, one commercial school, one agricultural school, and one nurses' training school. The total number of students in the municipal schools is about 7,000, of whom 2,000 are girls. The private schools, however, carry the bulk of the load. There are about 1,000 of these and the attendance is as high as 33,000.

In addition to the regular departments, there is a secretariat of general affairs which is charged with the care of official correspondence and files, the editing of the *Municipal Gazette*, a weekly publication, recording of documents and all matters not assigned to other departments. This work is directly under the supervision of the mayor.

The salaries of the higher officials are fixed by the charter. The mayor receives $500 a month, and each of the commissioners $400. The compensation of all other officers and employees is decided by the municipal executive council.

The most interesting feature of the provisional charter is the provision for a municipal advisory council, which is designed to represent the people of the city as an advisory body to the municipal executive council. It is here that the training of the people in citizenship comes in. The advisory council is composed of thirty members who are divided into three categories. Ten members are appointed for the first year, ten are elected by the people of the city, and ten are chosen by different economic interests as follows: three by the merchant class as represented in the general chamber of commerce, three by the labor class as represented in the labor organizations, one by the teaching profession as represented in the educational association, one by the legal profession as represented in the bar association, one by the medical profession as represented by the medical association, and one by the engineering profession as represented in the engineering association. Elections are to be held annually and each year the number of members elected by the people shall be increased by two and the number appointed by the governor decreased by two. The provision for the representation of economic interests as such is a new departure which may or may not owe its introduction to the dissemination of Soviet doctrines over the world. It is not, however, the result of local Bolshevism, which apparently does not exist. The municipal

advisory council was to have been organized within three months after the promulgation of the charter, but the good citizens of Canton were too apt pupils in the art of municipal elections. The first election was held and immediately contested on the ground of bribery and illegality. After a lengthy trial in the courts, the entire election was declared void and a new one ordered. This has just been completed, apparently with better success, but the council still awaits the appointment of the gubernatorial nominees before it can organize. The powers of the advisory council extend to the submission to the executive council of petitions presented by the citizens, the decision of matters submitted by the executive council, and the examination of the condition of the different departments. In case of disagreement on submitted matters, the final decision rests with the civil governor. The advisory council thus becomes sort of a permanent grand jury with a right to examine and report upon the conduct of the municipal government and each of its departments. The members of the Council receive $500 per year for their services.

The qualifications for municipal electors are as follows: Age of 21 years, domicile in the city of Canton for one year, legitimate occupation, ability to read the charter, good and sound mind, and full possession of civil rights. Elections are held one month before the expiration of the term of the acting members of the council and are supervised by an election commission of five appointed by the civil governor.

As in most governments to-day, the chief problem of the new municipality is that of finance. The sources and amounts of revenue expected by the city are given in the municipal budget as follows:

House rent tax (10 per cent. of annual rent, one-half by each party)	$645,045.00
Sing-song girl license	518,000.00
Theatre licenses	77,700.00
Cinema licenses	12,420.00
Boat licenses	28,956.00
Rubbish disposal	7,200.00
Rickshaw licenses	291,458.00
Market stall rentals	3,583.00
Rent from Taishatou Island	2,170.00
Public lands converted	63,520.00
Provincial government subsidies	240,000.00
Physicians registration fees	5,000.00
Special business registrations	1,270.00
Building permits	3,600.00
Blind singers licenses	1,500.00
Novelties license	500.00
Fines	15,180.00
Confiscations	414.00
Fines from Department of Public Works	960.00
Municipal Gazette	800.00
Municipal Hospital	1,200.00
Recording of title-deeds, etc.	49,000.00
Total	$1,969,997.00

The expenses of the government are tabulated as follows:—

Mayor's Office	$51,192.00
Department of Finance	63,652.00
Department of Public Safety	1,345,042.00
Department of Public Works	538,130.00
Department of Public Health	274,936.00
Department of Public Education	543,670.90
Department of Public Utilities	40,252.80
Municipal Auditing Office	28,392.00
Total	$2,884,249.70

The obvious deficit is $914,252.70. But in order to arrive at a real estimate of the probability of self-support, there must be added to this the provincial subsidies amounting to $240,000 and the land sales amounting to $64,520, thus bringing the deficit up to nearly half the total expenditure. A readjustment of spheres of taxation between the city and provincial governments will be necessary before the municipality can properly adjust its finances.

Meanwhile another long step ahead has been taken in the establishment of a department of audit to audit the accounts of the municipal government and to submit monthly statements, which are to be made public by the executive council. Annual reports are also provided for. Here indeed is a new departure in Chinese governmental affairs. If Canton can actually put into practice the idea that public money must be accounted for to the public she will highly deserve the gratitude of the whole country. The auditor is to be appointed by the civil governor and must be a man of special training in accountancy. His salary is fixed by the charter at $400.

As its title indicates, the present charter is provisional. After it has been in effect for five years, the civil governor *may* appoint a revision committee to draft a new charter and submit it to the provincial assembly for final approval and adoption. The fate of the experiment thus rests entirely in the hands of General Chen Chiung-ming or his successor. By the control which he retains he may make or break the cause of self-government in the capital city of the South. The drafting of a permanent charter which shall vest the control of the government entirely in the hands of the people of the city depends upon his favor. But what he has granted has been granted freely and is earnest of his sincerity. He has followed his action at Canton by granting a charter at Swatow, and now Wuchow, the largest city of Kwangsi, has received a similar document. It is an experiment under auspicious circumstances and will be watched with interest by those who are striving for China's advancement.

American Firms in China

NEARLY 500 concerns established entirely by Americans and American capital are operating in China, says a Washington report. American concerns represent approximately six per cent. of all the foreign firms doing business in the Chinese republic, In 1920 alone more than 400 American concerns opened for business in China. In 1914 there were only 136 American companies here. The growing friendship of Chinese business men for American companies, and their seeming preference for American-made goods is causing concern to the business men and exporters of England, France and Germany, according to records of the department of commerce.

More than 7,000 American business men are devoting their entire time to managing their concerns in China. A far larger number of American manufactures and exports have a direct interest in the republic through a continuous exchange of commodities and raw materials. In addition American financiers are interested through loans made to the government. A large number of Americans hold bonds of the Chinese republic. The exact number is not known, but it is understood to be well into the hundreds.

Cheap Western Labor

ACTING Commercial Attaché Butts, at Tokio, reports that the output of pottery has fallen off about 30 per cent. in Nagoya and the industry remains in a depressed state. The glass industry is in even worse condition, several of the larger plants having practically shut down. The trouble seems to be inability to compete with cheap Occidental labor.

Get that last sentence. Japanese industries are shutting down because of inability to compete with "cheap Occidental labor." Japan is a part of the Orient, of course, and the Occident is always complaining about the cheap labor of the Orient. And here is the Orient complaining about the cheap labor of the Occident. Like as not the first thing we know the people of Japan and China will be asking a tariff against our cheaply produced American goods.—*Joplin Globe.*

The Railway Concession in China

(Contributed)

TO China the word "concession" has always been "anathema," recalling the great humiliation of 1895, when Japan exposed to the Western powers, China's true value as a military power.

The Chinese Eastern Railway concession was the offset for Russian aid, which secured the retrocession of the Liao Tung Peninsula on the termination of the Japanese war. The Yunnan Railway was the French reward for friendly and traditional co-operation with Russia for the same ends, while the Shantung Railway was a purely commercial transaction, drawn on lines quite usual elsewhere, with the vital omission that China did not receive the usual monetary compensation. This feature characterized all three concessions, though in the case of the Chinese Eastern Railway there was mention of a payment of 5 million taels, a condition tacitly ignored until the present year (1920) when China again assumed a degree of control over the railway.

The conditions of all these concessions were curiously vague and the reverse of what are usually considered vital conditions. Generally, the concessions give the impression of a half learnt lesson in Western cunning or divided counsels on the question of confidence in European advice. Thus the Chinese Eastern Railway agreement gave Russia exclusive mining and development rights over a zone bordering the railway whose extent is left undefined. It is definite enough on the 36-year clause after the lapse of which China might purchase and also on the question of cession to China free of cost after the lapse of 80 years. Again in the Yunnan Railway, the French have neither police nor mining rights, but there is a vagueness over the questions of cession or purchase, an omission probable accounted for, by the fact that Yunnan is a far cry from Peking and the natural obstacles enormous for railway construction which would make the extension of this line a menace to regions were Chinese rule was worth maintenance. The absence of police and mineral rights is also perhaps an indication of the appreciation of the secondary role played by France in the Russo-French combination. Further in the case of the Shantung Railway though mineral rights for a distance of 10 miles on either side of the line were ceded, and Germany acquired exclusive rights for the creation of a railway system for Shantung, China merely reserved the rights of purchase at some unspecified date. A feature of all the agreements was the insertion of a clause stipulating that work was to begin within six months of signature. This clause was more honored in the breach than the observance, as China was in no position to insist on its compliance.

As a whole, "force majeure," was too evident in the initial stages of all three concessions, but only in the case of the Chinese Eastern did this state of things persist. In Manchuria, Russia pushed through her great scheme at a speed which only the presence of foot, horse and guns continually at hand could have secured. In five years, the Chinese Eastern Railway and its branch to Port Arthur (over 1,500 miles) was virtually a *fait accompli* and Manchuria, a Russian dependency as regards the railway zone; But Russia spent money in the country in prodigal fashion, provided employment for thousands and golden opportunities for the exercise of the trade genius of the Chinese. Also to a certain limited extent, though the commercial aspect of the scheme was obscured by the strategic, the country benefited from the provision of railway transport, and the consequent opening up of new or more distant markets for the products of an extremely rich province. These benefits would never have been so quickly secured under a dilatory and ultraconservative empire, which, though harried and cajoled by Li Hung-chang with a persistance and energy which always characterized him, took 16 years to complete 262 miles of the Peking-Mukden Railway.

In the case of the Shantung Railway, a thoroughly business atmosphere characterized its outward operation, but there was always the garrison of Tsingtau in threatening proximity. Another feature was a thorough and exclusive protection of German trade interests which stifled all attempts at foreign competition. Germany however loyally abided by her undertaking not to transport troops out of the Tsingtau zone unless the situation got beyond the control of the local authorities, and even went so far as to assure the United States in 1902 that she considered her rights in Shantung as in no sense constituting a monopoly. Unquestionably the creation of these two railways and above all, the ports of outlet, Dalny and Tsingtau, enriched China's revenue earning capacity. The material welfare of the people in the railway zone was advanced. Dignity was doubtless offended, but a dignity which relies for support on the traditions of a splendid past is bound to suffer in contact with those for whom the past has no appeal. Perhaps the denial of the right to obstruct was the greatest wound to Chinese pride.

As for the French concession of the Yunnan Railway, construction was delayed till 1904 and when put in hand, proved enormously costly both in lives and money—a tax on a new colony out of all proportion to the benefits conferred and a staggering financial burden added to the generally unproductive French colonial empire.

Thus, as a result of great expenditure, France established a sphere of influence, which may have a great future but only as the result of further colossal financial effort. France further exercises control over a railway which is a perpetual tax on colonial revenues, while China benefits by increased accessibility to a hitherto secluded and isolated province, and further, to the extent of customs revenues, which, but for the railway, would never have been feasible of collection.

Without doubt, the settlement of Russo-Japanese differences in 1904 on Chinese territory was a highly reprehensible proceeding, but here again some localities are fated for these decisions, for just as Belgium is the battlefield of Europe so was Manchuria fore-ordained as the place of impact for Russia and Japan. The railway merely localized the fighting and devastation and probably hastened the end, and who is to deny that Chinese sutlers and camp followers reaped a golden harvest during hostilities. Again China profited by the Japanese victory in the substitution for Russian muddle, drift and corruption, of a Japanese administration over the southern 500 miles of the Chinese Eastern Railway (from Dalny to Changchun). This administration has been remarkable for its efficiency and its vast development schemes in which the Manchurian population share, to a very considerable extent.

Then, without a doubt, considerations of sentiment aside, China's concession railways have not served her badly. Materially, they must have all assisted her and China now exerts a divided control with the Russian shareholders of the Chinese Eastern Railway, a control which the powers will without question preserve.

It will not be denied that China suffered moral wrong in being coerced into modernization, but ethics have no influence with peoples with the calls of empire to satisfy and the wherewithal that brooks no opposition. China should be thankful that she was never called upon to guarantee a purely strategic and unproductive railway as Persia was by Russia in 1912, and that she has never groaned under the burden of a kilometric guarantee.

This form of guarantee, under whatever conditions, is the sort of gilt edged ultra-profitable security which all railway concessionaires dream of, but fortunately for the exploited, few obtain. Briefly, this form of guarantee ensures a perpetual dividend without the effort to earn one; there is no inducement to develop traffic, the line must be maintained to carry a specified number of daily trains for which the rolling stock may be adequate or the reverse; in short, everything in the agreement is carried out to the letter and nothing further. This pernicious system is a feature of some of the Macedonian Railway agreements, and of some of the French concessions in Syria, but the Bagdad Railway and the Anatolian system from which it originated, are the most fantastic examples of outrage on intelligence and contemptuous exploitation which reveal the rottenness of Turkish officialdom and German moral turpitude.

This concession was the outcome of the Kaiser's second visit to Constantinople. Its salient features were as follows: The

company was Turkish but the perpetual predominance of German control in this company was amply secured. The concession was for 99 years and the terms of cession to the Turkish government absolutely prohibitive. Construction at any time could be indefinitely delayed. For each 200 kilometre section the Turkish government was called upon to guarantee bonds to the amount of 54 million Francs, irrespective of the character of the work. The working of this clause is well illustrated in the construction of the first 200 kilometre section between Konia and Eregli. The loan for 54 million francs was duly floated and realized £1,868,000 or £14,944 per mile. The actual cost of the 125 miles (200 kilometres) cannot have exceeded at most £5,000 per mile, or a total of £625,000, so that the company pocketed £1,243,000 and realized a profit of 400 per cent. This section was completed in 1904 and there is no construction difficulty east of this until the Taurus Mountain Section (built during the war) is reached. Consequently, even if the company were compelled to disgorge for this most costly bit of work it was not until they had had the use of this money, and any added profits, for over 15 years. Even then, it is a question whether this section was not constructed by combined Austrian and German governmental agency. Further, for working expenses of the line, the Turkish government agreed to a guarantee of 4,500 francs per kilometre and as the Bagdad Railway Company handed over each section to the Anotalian Railways to operate when completed and paid them at the rate of 3,700 francs per kilometre, the company again made a certain and unearned profit on operation.

The holders of the Turkish government bonds sold for the construction of the line, had no voice in the management which was entirely vested in the company, whose capital was only 15 million francs half piad up. Turkish capital liability for each section could not exceed the above 54,000,000 francs—a tempering of the wind to a lamb already very much over shorn—; for in addition to the burden of the Bagdad Railway, Turkey had agreed to a kilometric guarantee of 15,000 francs per kilometre on the 587 kilometres of the German-built and controlled Anotalian Railways. It is calculated that the kilometric guarantee cost the Turkish taxpayer £9,000,000 between the years 1889 and 1907.

All told, the German railway ventures in Asia Minor must have given satisfaction to the Kaiser, who was, in the main, responsible for them. Germany became paramount at Constantinople and with consummate cleverness retained her supremacy through the revolution of 1908 and the débâcle of 1912. Turkey has the empty satisfaction that if her money went to enrich the German concessionaire it was returned many times over in order to equip her in a fight against her old time ally Great Britain, who, but for the Russian bogey in India and pre-occupation in Egypt, might have elected to defend her interests in Asia minor and saved Turkey from herself.

Turkey's railway history shows the darkest side of the concession question and is the exception which proves the rule. If we turn to South America a very different state of things prevails. The prosperity of the greater South American republics is undoubtedly due to the wholehearted adoption of the concession principle, particularly as applied to railways, docks and harbors. Isolation and the Monroe doctrine, forbade the use of concessions as weapons for empire builders. The concession became in South America a hum-drum business proposition, with no political furture before it, no nucleus for magnificent and megalomniac dreams, divorced entirely from romance unless local revolution is considered, and this could only end in the bathos of distraint for damage sustained. Thanks to the United States, South America will never witness "a battle of concessions" or be the victim of "conquest by railway and bank" and will never undergo that sure process of strangulation which follows the creation of a sphere of influence which begins with protestations of goodwill and ends, in some cases, with the organized regrettable incident, which is the prelude to protectorate and national death."

South American history since the beginning of this century is a record of progress extraordinary. The greater republics have learnt the futility of revolution and grasped the fact that governmental stability ensures the flow of foreign capital necessary for the country's development. Thus, it is estimated that the investments of Great Britain alone in Latin America are in the neighborhood of $4,000 (gold) million, while Germany, France and Belgium have put another $1,000 million into the country.

The bulk of British money is sunk in railways, docks and harbors, which have been financed of concession lines and are the absolute property of the concessionaires. In the Argentine alone, British money to the extent of $1,000 million dollars has been invested in concession railways. Here the concession principle is so general that in 1909 what is known as the Mitre Law was introduced for the future regulation of railway concessions. Previous to this each railway controlled the terms of its own concessions but from this date onwards all concession railways are exempt from all national, provincial and municipal taxation and import duties on material until the year 1947. The railways pay to the government a single tax of 3 per cent. on the nett earnings, the amount of such earnings to be ascertained by deducting 10 per cent. from the gross receipts. The result of the use of the concession principle has been that the Argentine has been provided with a railway system, of 21,000 miles built and maintained to first-class standards and adequate to develop the land which the natives have been, and are now doubly so, careful to keep in their own hands. The trade of the Argentine between the years 1904 and 1913 increased 108 per cent. and was valued at over $996 millions in the latter year. The credit of the country is now exceptionally good whereas in 1890, the dawn of the era of regeneration, and the date of the last revolution, she was practically bankrupt, beggared by unparalleled corruption and internecine strife. Could there be a stronger testimonial for the concession principle, for the railways made the prosperity of the country and owe their origin to it. The Argentine is no exception either, Chile, Uruguay, Brazil, have all made the fullest, freest use of the nations with money to lend, to their unquestioned lasting benefit.

To turn elsewhere in the world, even Portugal has been driven to the granting of concessions for the development of her burdensome African colonies. This was not done without a wrench, for Portugal is very jealous of the safety of these links with past greatness. Besides, the colonies provide a host of sinecure appointments for the official classes and as this class more and more tends to become the bulk of the population, their retention at all costs becomes a necessary undertaking of the rapidly changing governments. Where unfertilized by capital these outposts of Portuguese Empire are a uniformly barren and melancholy spectacle. The Portuguese is no pioneer, he clings to the stifling coast towns. These towns in every sense are moribund, dying under the influence of climate. This state of things will persist until the absurd tariff laws are repealed (absurd inasmuch as Portugal is not a manufacturing nation) and foreign capital encouraged to the utmost, instead of, as in China, being given a grudging suspect and obstructed admittance.

If then China is reluctant to do business with the consortium, she would do well to revise her decision with regard to concessions. China would profit exceedingly could she rid herself of the tendency to be swayed by canards and catch words. This is an unfortunate Chinese trait, due to an age old system of education, which tends to develop memory more than reasoning faculty. Moral saws proverbs and catch words thus acquire undue importance and exact unreasoning obedience. This is why " concession " has become a synonym for disruption and national destruction and explains the limited success of the interested and instigated campaign against the consortium in which the slogan has been " sovereignty and monopoly."

At all costs China must have foreign capital. There is room enough for the consortium and the concession system of raising it, but a preliminary must be the adoption of a more trusting attitude and realization that the country is no Eldorado which the nations of the earth will scramble to finance.

Development of Rolling Stock on N.E.I. Railways

(Compiled by the N.E.I. State Railway and Tramway Office)

IN the December number of THE FAR EASTERN REVIEW we described the development of the locomotive rolling stock on the Netherlands East Indies Railways. The history of the development of the freight and passenger rolling stock may be briefly sketched as follows :

Until the year 1894, nothing but *two-axled* trucks or cars were in service. In 1895 the first *four-axled* box cars came into use. Since then, trucks having a fixed wheel-base of 1.50 M. have been imported for high open goods-wagons and flat cars, as well as for the type already mentioned above. In 1904 the allowable load of the two-axled wagons was increased from 8 to 10 tons, which could only be done after the old axles with thickness in the hub of 100 mm. and a journal's diameter of 80 mm. had been exchanged for new ones with 116 mm. thickness in the hub and journals with 90 mm. diameter.

During the war, when no new rolling stock was coming out, the scarcity of cars was so great that it became urgent, by way of temporary measure, to increase the allowable load of the two-axled cars from 10 to 12 tons, and that of the four-axled ones from 20 to 24 tons. Meanwhile axles of 125 mm. hub-bore were already, and for that matter, still are, being ordered, so that by degrees the replacing of the thinner axles by thicker ones will render the temporary measure a permanent character.

The following are special cars :—

No. 1, see page 108, is a six-axled well wagon running on 2 three-axled trucks, designed for the transport of heavy, bulky engine parts, total length of frame 18.70 m.; available length of the well ad 10 m.; carrying capacity 30 tons.

Furthermore a steam wrecking-crane on 6 axles weighing in working order about 60 tons with a greatest capacity for lifting 15 tons at a swing of 9.15 m., and a lifting-speed for the same load of 7 m. per minute.

Moreover there are 35 "breakdown" vans placed at various stations; these are box cars provided with complete inventories, which contain various toots and implements for clearing away impediments and wrecks.

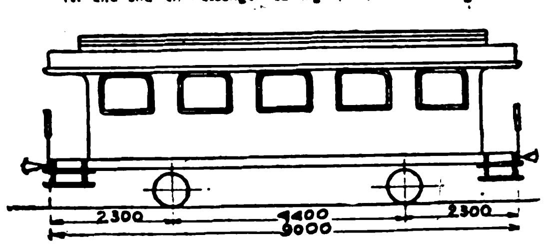
If it was possible to manage for a long time with 2 axles and a fixed wheel-base of 3 metres for the cars, with the passenger-coaches the need of longer vehicles was very soon felt; longer than would be possible with the 3 metres fixed wheel-base imposed by the mountain-lines with their minimum radii of 150 metres. This gave rise in 1881 to the importation of the first series of coaches carried on 3 what are called Cleminson trucks. By this system the three axles are placed in such a manner in frames coupled to each other, that the two outermost axles adjust themselves to the curves, whilst the middle axle has lateral play. With the increase of the speeds, however, these coaches proved to be unsuitable, also because they were too lightly constructed, and it was found necessary to use, by preference, bogie-carriages also for the sake of steady running. We find in the Kiebitz under frame and effort to render a longer wheel-base possible for mountain-lines whilst retaining two axles; this design comprises two one-axled trucks.

On account of their insufficient strength these Kiebitz frames are gradually converted into and superseded by frames with flexible axles (Lenkachsen).

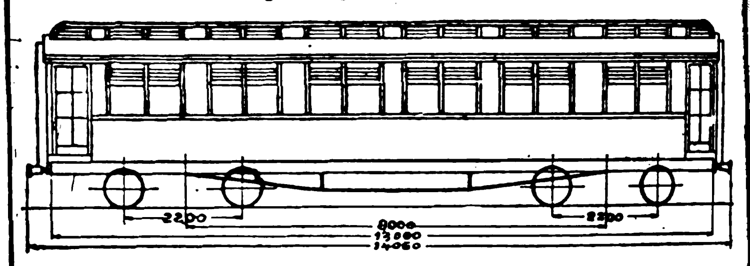
The first coach on two-axled bogies was the saloon coach of H.E. the governor-general, which was put into service in 1891 (now out of date and converted).

It was not until 1895 that a beginning was made with the regular building of coaches and luggage-vans mostly measuring a length of 13 m. and placed on two two-axled bogies. There are now various bogie systems in use, namely simple ones without a cradle, trucks with a "swan neck" equalizer, trucks with cradle hangers inside the frame-plates according to American and European practice (this system is gradually being superseded by that one with the cradle hanger placed outside the frame-plates) and trucks having the cradle-hangers and cradle-springs placed outside the

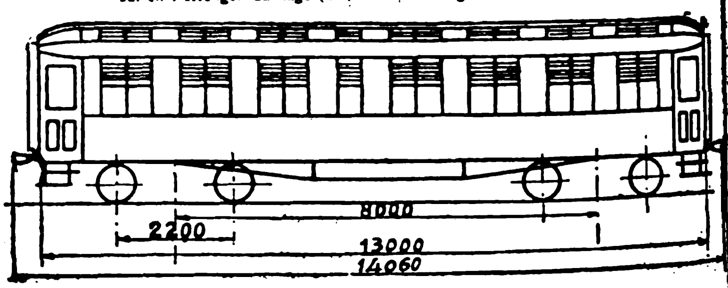
1st and 2nd cl. Passenger Carriage (AB) 9 Meter long.



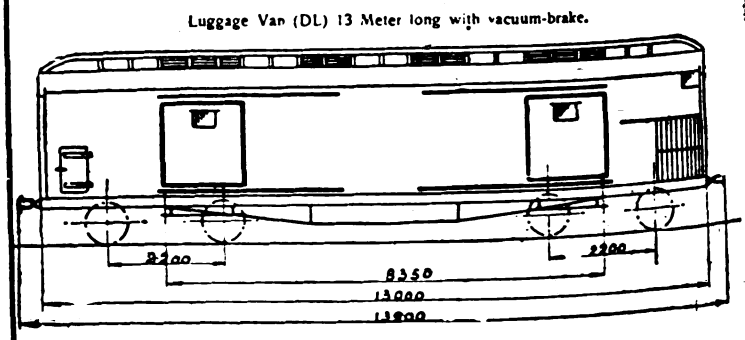
1st. and 2nd. Passenger Carriage (ABL) 13 Meter long with vacuum-brake.



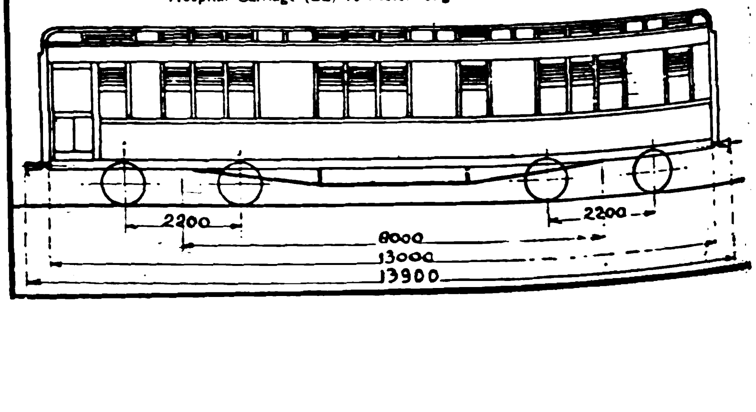
3d. cl. Passenger Carriage (CL) 13 Meter long with vacuum-brake.



Luggage Van (DL) 13 Meter long with vacuum-brake.



Hospital Carriage (EL) 13 Meter long with vacuum-brake.

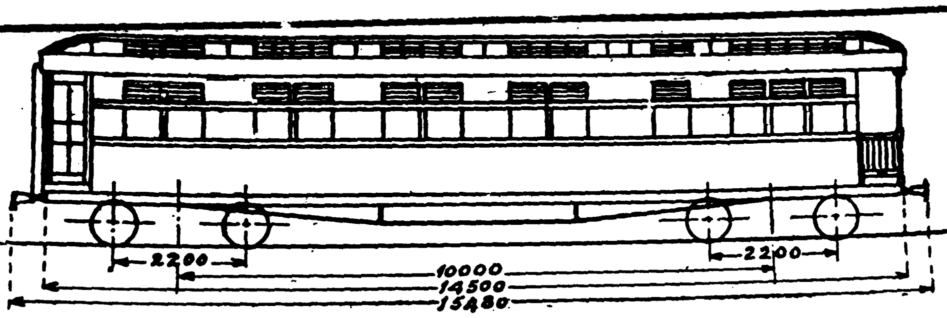


frame-plates. Experience has taught that copying the American cradle-trucks for adoptation on a 1067 mm. gauge, has not led to the favorable results which were expected, not even when the hanger-pins were replaced by knive-edges. It was only in 1908, when the hangers and cradle-springs were placed outside the frames, that a type of coach-truck was obtained which ran steadily even at the highest speed (100 k.m. an hour). Since then, this principle, which has given such excellent results, has been applied to all the new coaches (also to those measuring 18.5 m.)

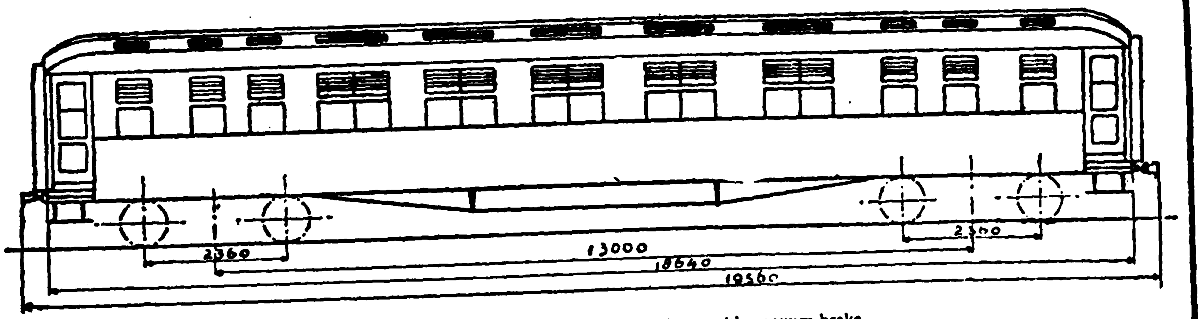
Also in order to increase the easy running of the coaches and to prevent any tiresome "rocking" movement, the old wheel-bases of the cradle-trucks have been increased from 1.50 m. to 2.20 m., which latter measure now holds good for all 13 metre bogie-carriages and luggage-vans with distance of 8 metres between the pivots. In the case of the 18.5 metre coaches, the wheel-base of the trucks and the distance between the pivots, are 2.360 and 13 metres respectively. It proved impossible to make them larger.

Experiments, begun in 1910, with a new profile for wheel-tyres proved, that the running of carriages was ably improved by rendering the side play between flange and rail-head smaller for the straight stretches by a moderate taper and still more by the profile of the flanges throat.

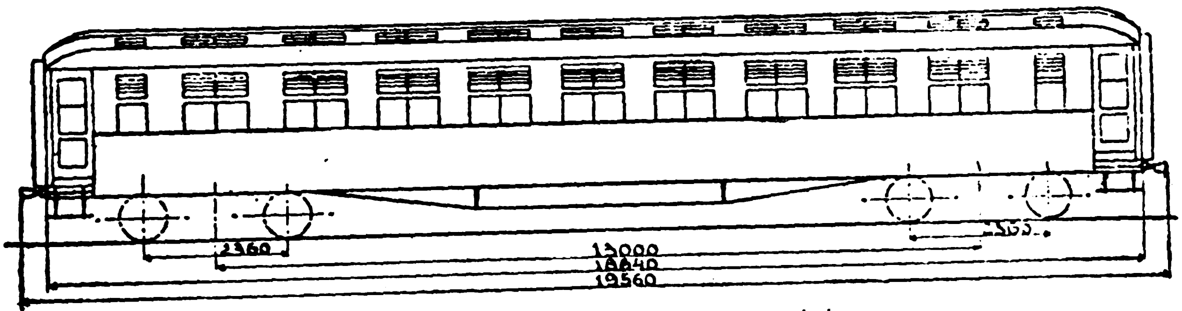
In consequence of this, the new tyre profile is gradually being introduced in accordance with which the flange is made thicker, the taper of the tread has been altered from 1/20 to 1/40, the outer taper from 1/10 to 1/8 whilst the former



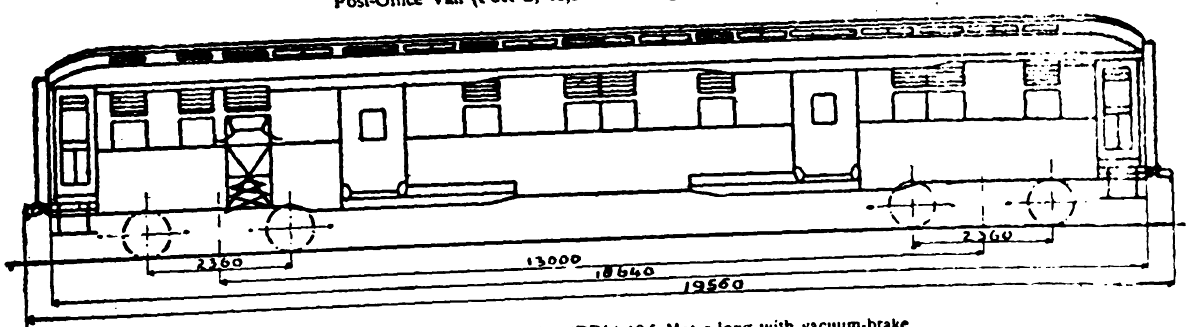
1st. and 2nd. cl. Passenger Carriage (ABL) 18,5 Meter long with vacuum-brake.



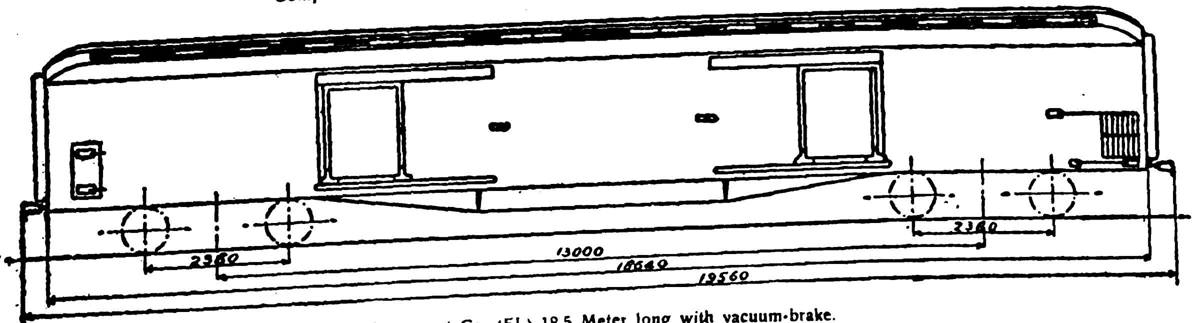
3d. cl. Passenger Carriage (CL) 18,5 Meter long with vacuum-brake.



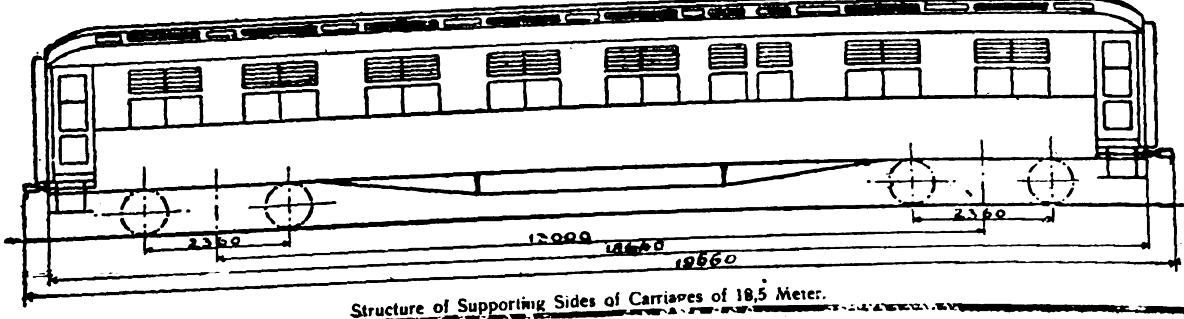
Post-Office Van (Post L) 18,5 Meter long with vacuum-brake.



Composite Post and Luggage Van (PDL) 18,5 Meter long with vacuum-brake



Restaurant Car (FL) 18,5 Meter long with vacuum-brake.

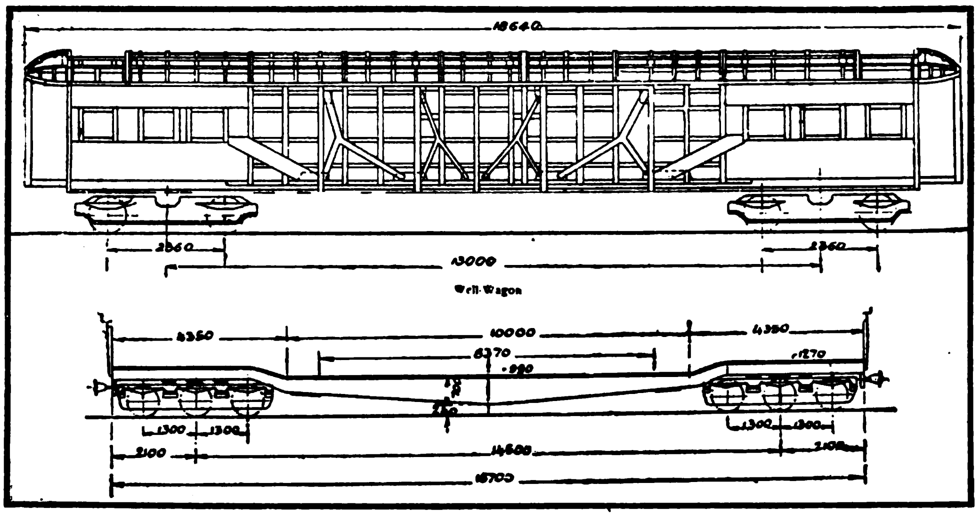


Structure of Supporting Sides of Carriages of 18,5 Meter.

flange throat radius which had been 11 mm., has been altered into one with a radius of 30 mm. merging into a 15 mm. one.

The intention at present is, to apply flexible axles (Lenkachsen) wherever the wheel-base exceeds 3 metres on account of the curves of 150 m. minimum radius, so that in future no other system will be met with in the case of two-axled carriages.

In addition to the coaches of 13 m. in length and to improve the riding qualities when running in other ones have been the express-trains with maximum-speeds of 100 k.m. an hour constructed with a length of 18.50 m., without a separate under-structure, but with weight-carrying side walls constructed like bridge-girders. This construction is chiefly executed in iron and is stronger than those of under frames which separate wooden bodies. Where as the coverings are of wood, it is possible to combine the advantages of strength (iron frame) with coolness (wooden coverings). The increase of the length aimed also at the reduction of the specific resistance especially the air resistance per ton tareweight as compared with the present 13 m. cradle-truck carriages. To prevent rocking, a strong coupling apparatus has been applied with two sidebuffers and an automatic, central coupling hook.



Express Train Coach and Well Wagon

The 18.5 m. AB coaches can seat 24 second class and 14 first-class passengers (as contrasted with 18 and 8 respectively in the 13 m. coaches); the 18.5 m. C—coaches with transverse seats, can accommodate 72 passengers (as contrasted with 55 in the 13 m. coaches).

The 18.5 m. dining cars can accommodate 26 persons, at 10 single and 8 double or "family" tables, as they are called (as contrasted with 14 in the 14.5 m. cars). The 18.5 m. luggage-vans will have a capacity of about 12 tons (whereas the 13 m. vans could only take 6 tons).

The design of 18.5 m. long postal-vans and postal luggage-vans, is at present under consideration.

The walls of these cars are rendered to enable it to carry weight by the application of a sort of iron trusses between the roof-beams and the floor. In addition to this the ends of the sides are fitted with armoring plates also with the intention of lessening the danger of telescoping in case of collisions.

It is easily understood that for these coaches and cars, heavier bearing and cradle-springs and also heavier axles and wheels had to be designed. These have a hub bore of 150 mm. and a journal with a diameter of 115 mm. and a length of journal of 200 mm. (as contrasted with 154 mm. journals length in the case of the ordinary axles of 90 mm. journal's diameter). It is worthy of note, that a width has been attained in these coaches which only differs from that of the large European corridor-coaches by about 20 cm., whilst the difference in gauge consists of 143.5—106.7=36.8 cm.

The type of carriage with a central passage which is used in the East Indies, as well as in America, is retained on account of its advantages for the tropics outweigh the disadvantages. They are cooler and roomier for seating the passengers, although the hindrance of the passing to and fro is not in their favor.

A word may be said here as to the interior finish of the present-day carriages. Already with the last number of 13 M.A.B. carriages the assistance of a specialist for interior panelling and outfitting was called for.

The design for the interior decoration of the latest 18.5 m. dining cars was drawn by the well-known Dutch artist, Willem Penaat.

The interior displays a simple yet pure design of the main lines together with a very correct and able application of color of the materials, a mastery of color which took care of even the smallest details.

The car is divided into front and rear platform dining saloon, kichen, pantry and w.c. When the main lines and form details were designed special attention was paid to the construction of the car, and the decorative architecture is of such a nature that the large panels are fixed by means of borders, straight onto the frame of the car.

In division of the panels, care has also been taken to connect the side-walls and the partition-walls in a satisfactory manner, so that a well-finished whole is the result.

The ceiling is divided into square panels, indicating as a matter of course the pace of the ventilators and windows. Open-work panels of an oblong shape are introduced for the sake of ventilation, into the sky-light, and these with the fretwork above the windows give a certain effect of lightness as contrasted with the otherwise for all character of the decoration of the car. The difference between the dark teakwood work and the sky-light, which is carried out in light-colored Swiss maple and birch triplex, is softened by means of three horizontal bands of teakwood.

For further particulars, see the article in the "Groene Amsterdammer" of 30.8.19 by Otto van Tusschenbroek.

Further special carriages are the following ones :—Two saloon-coaches for H.E. the governor-general, which were built at the main workshops at Bandoeng, having under frames 18.5 metres long one of which is destined for use on long journeys possessing two sleeping-apartments, a bathroom, and a sitting-room for four people as well as a saloon ; and the other one designed for short journeys, without sleeping-apartments, but with a bathroom, two sitting-rooms for four people and a saloon. Both are fitted with electric light, on the Brown Boveri system, and with electric fans.

Furthermore there are too ambulance-cars with 13 m. frames designed to run in express-trains at a speed of 100 k.m. an hour, and in case of need are also suitable for the most transportation of wounded, as they are fitted with 12 stretchers, a medicine store, an operating-table, a compartment for six attendants, electric light (Boveri Brown system) and electric fans.

Moreover we find 35 Red cross vans on 2 flexible axles (Lenkachsen) distributed amongst various stations. Each van is equipped with 16 stretchers and supplies of first-aid material for the transport of wounded in case of accidents and in time of war.

Finally there are 13 postal carriages, on cradle-trucks on 11 m. long uuder frames. These carriages were originally fitted out with electric light which afterwards was replaced by aceton-lighting.

For registering ad collecting various data about tractive power capacity specific resistances of engines and various classes of carriages, and specific brake resistances the construction of a so-called dynamometer bogie-carriage is being considered so as to enable the future designer of rolling-stock to make a fruitful use of these data

and to introduce improvements to of the designs. This dynamometer van which will also be very useful for drawing-up rational load schemes, will be built by the firm of Beynes at Haarlem, whilst the various registering instruments will be supplied by the well-known firm of "Amsler Bros." of Schaffhausen. In the main this carriage will be a copy of the dynamometer van used by the Swiss State Railways, a detailed description of which was published in the *Schweizerische Bauzeitung* (Swiss Building Journal), 1914, Vol. 64, Nos. 4, 5 and 6.

The development of the draft and buffing gear has kept equal pace with that of the maximum train loads to be transported.

As a peculiarity it may be mentioned here, that originally the rolling stock was fitted up with a central coupler system Pikl, such as is said to have been first introduced on the Norwegian railway in Europe.

Since it has been frequently applied to rolling stock built in England. From this the present draft and buffing gear has been developed.

In 1878, however, in defiance of Indian advice an effort was made to introduce the European two buffercentral-hook system, but at once voices were raised in Java against a further application of it after its small practical utility and the dangers connected with its manipulation had become apparent.

Carriages, fitted with this system of coupling, were immediately altered and fitted with the Pikl system with automatic central coupling without side buffers. For many years buffer shafts of 41 mm. diameter in the stern coupling pins of 36 mm. diameter, and 5-ton volute springs have been considered quite sufficient.

In 1909 the 7-ton buffer springs and couple pins of 55 mm. diameter came into use whilst as early as 1916 the 12-ton volute springs with fortified buffer shafts of 2 diameter and coupling pins of 55 mm. diameter were applied in large numbers.

As regards the buffer spring in connection with the existing other dimensions the utmost attainable dimensions have been reached. Should it be deemed necessary at any time to make the buffers, coupling chains, etc., heavier an entirely different model will most probably have to be designed.

As was already mentioned formerly coaches destined for a maximum speed of 100 k.m. hour have been fitted with a central automatic draw hook and two side buffers. The idea was, to combine the advantages of the existing Indian automatic coupling system with those of the system in use in Europe (with side buffers but without automatic coupling of the Norwegian hooks).

On account of the great speeds at which the Java express trains will have to run special attention was paid to the trucks and to the brake gear.

The newly designed trucks unlike those built with pressed steel frames should be strong (and stiff showing little elasticity. For this purpose they are stiffened) diagonally and by large corner plates. The broad pedestals are 48 mm. thick whilst those of 13 m. coaches and vans are only 16 mm.

Moreover these carriages and luggage-vans are fitted with vacuum quick-acting-brake-valves of the Austrian type A. T. and emergency-valves of 1 inch diameter.

When the goods trains became not only heavier but also longer, the difficulties connected with excessive lengths became apparent, with the result that by way of experiment the hand brake system was replaced by the vacuum brake on special goods trains chiefly for long-distance traffic. Although a series of cars were fitted with a vacuum brake for that purpose and although the authorities intended also to make use of the vacuum quick-acting-brake-valves of the Austrian type "K," up to the present moment no further steps have been taken to make the application general. Of the two types of automatic slack adjusters under trial (with rack and sector gear) the one with the sector seems to be better filling the requirements.

With regard to the lighting of carriages progress has also been made. A distinct step forward was taken when the original candles were replaced by paraffin lamps.

In 1910 the Aceton illumination was introduced whilst since 1917 several carriages have been fitted with electric light installations of the Brown Boveri system (with fine self-regulating two-position roller for maintaining an even voltage and for regulating the supply of current when eventually the accumulators are cut out). Some others are fitted with installations of the Stone system (of a simpler construction than the other one but with twice as many accumulators not regulating itself so precisely and much more sensitive to accumulators defects).

Electric lighting has the advantage over gas and paraffin lighting of causing no danger by fire in case of accidents, moreover the electric energy can be utilized for driving fans, which contribute considerably to the comfort of the passengers in the tropics. The intention has been to light express trains electrically, fast and slow trains partly electrically and partly with aceton, and the other trains with paraffin lamps placed in the ceiling.

All 18.5 m. coaches will be lighted electrically.

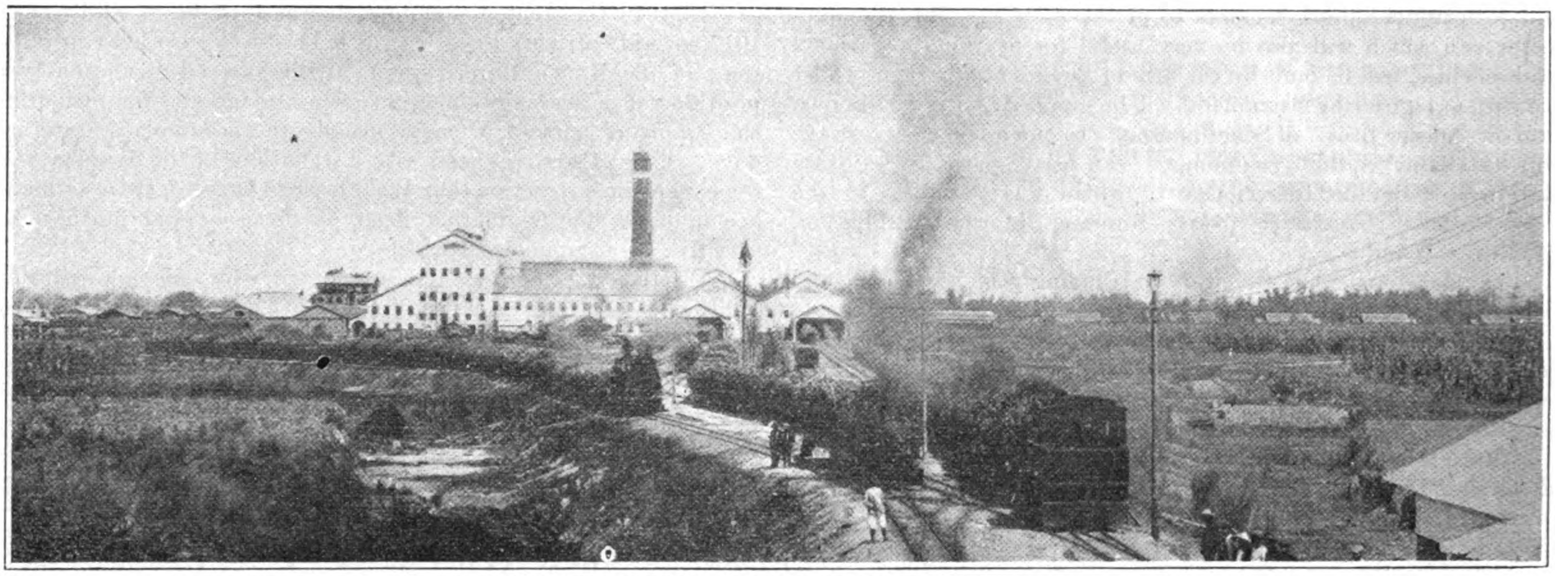
Tin Mining at Kotchiu

AT a recent meeting in London of the institute of marine engineers a paper by Mr. Wm. Semple on this subject was, in the author's absence, read by Mr. J. Adamson, secretary of the institute.

The mining village of Kotchiu, which Mr. Semple visited on behalf of Messrs. Shewan, Tomes & Co., lies in the south-west corner of the province of Yunnan, about 800 miles distant from Hongkong. Tin mining probably started there about 400 years ago. All the mines are situated on the tops of high mountains or in the gulches between them. Alluvial mining was carried on extensively in the earlier years, the ore being plentiful and easy to get at. It is said by some of the old miners that when mining was first started it was to obtain silver, and during prospecting the great tin ore beds were discovered. The abundance of tin ore in the district is really remarkable. Although alluvial mining was carried on extensively, the miners opened tunnels in order to search for a finer grade ore, and some of these extend into the mountains from 2,000 to 4,000-ft., from 3,000 to 10,000 men being employed. The largest mining firm is the Yunnan Tin Trading Company, who are at present installing large pumping plant in order to enable them to work the whole year round, and supply sufficient water for ground sluicing at their open mines at Malaga Hill. The tunnels going into the mountains are not more than 4-ft. square, and descend at an angle of 45 deg., and are very poorly ventilated. The miners are all small men, and their average age is from 12 to 25 years, while, owing to the bad living conditions, the mortality among them is very high.

The ore is principally earth ore, and, after extraction, it is crushed by native methods, either by hardwood clubs or a stone crusher driven by large water-buffaloes ; then it is all hand washed, the ore receiving about 40 washings before it is smelted. The native furnaces are very interesting—they are built with mud bricks and have a little over a ton capacity. The air blower is native made ; the barrel consists of a large piece of timber hollowed out and fitted with a piston, the air-suction valves being of buffalo hide and the air discharge going direct into the bottom of the furnace : the whole apparatus is worked by manual labor, and it takes from eight to ten hours to make a cast. The smelted tin is run into sand moulds, the amount of metal obtained running from 92 to 99 per cent.

The Yunnan Tin Trading Co. have a large and up-to-date smelting and concentrating plant, which was built by the Germans about ten years ago, and run by their own men. On the outbreak of war the Chinese took it over, but have never used it until quite recently, when they put it under an American administration. When working fully it will handle 1,000 tons of ore a day. The chief trouble is in the refining of the tin, due to the high percentage of lead and arsenic. Formerly it used to be shipped to Hongkong, and re-melted and refined before being put on the market. An American mining engineer as well as a smelting specialist have been engaged to bring the tin up to the required standards.



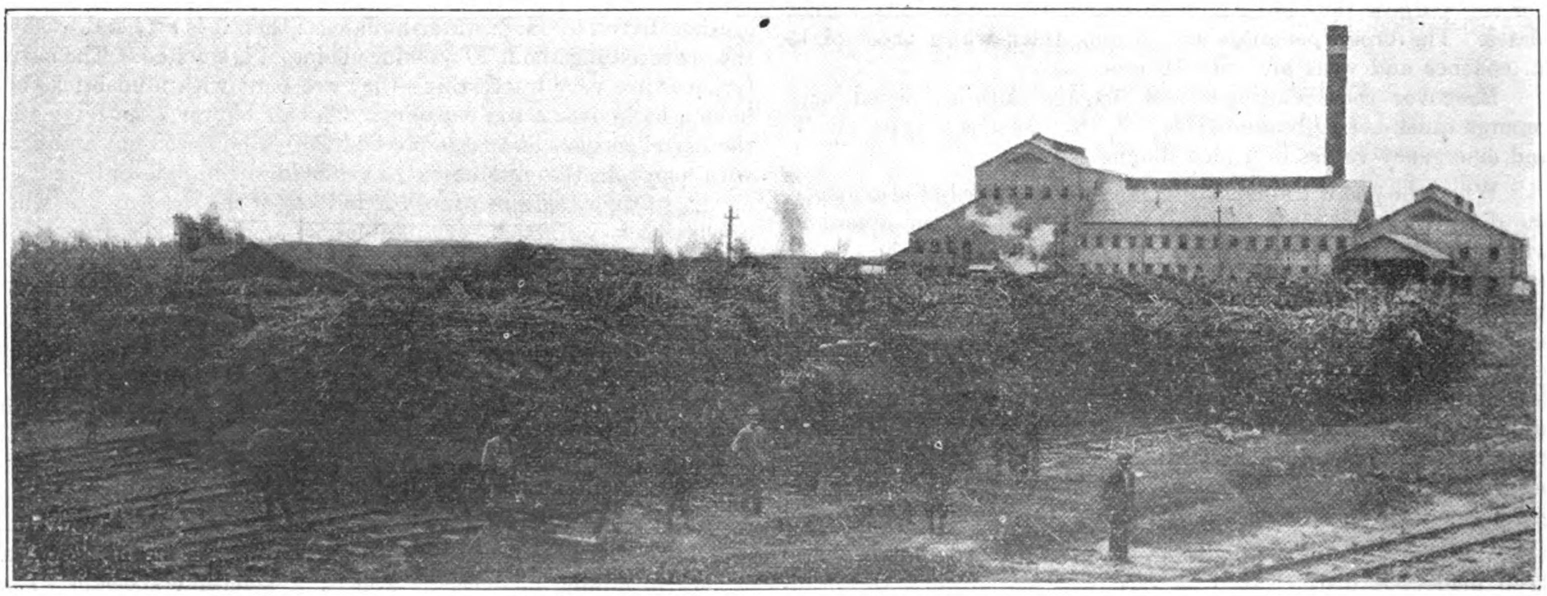
The Great Ako Mill of the Formosa Sugar Company

The Formosan Sugar Industry

UNDER Chinese rule, the island of Formosa produced 60,000 to 80,000 tons of brown sugar per annum, of which, 45,000 to 50,000 tons were exported. The value of this product was about Y.4 per picul or $35 (gold) per ton, on which the Chinese government levied a duty of about $1.50 per ton.

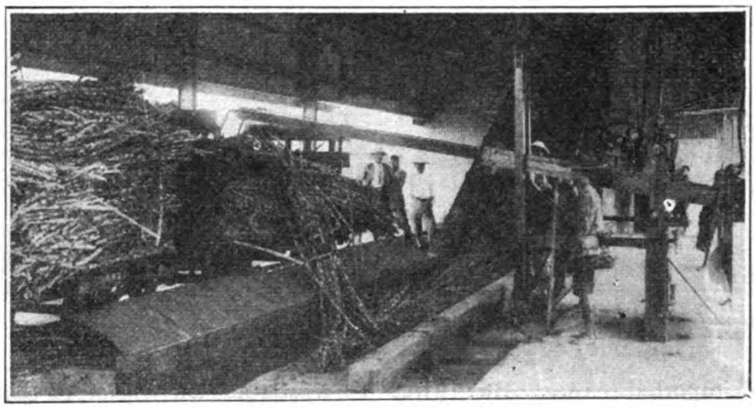
The modern sugar industry in Formosa dates from the year that the island came under the rule of Japan as a result of the war with China in 1895. It was not however until 1902 that the Japanese government began to interest itself in the development of the sugar industry, when active steps were taken for its encouragement through the establishment of an official sugar bureau and the enforcement of stringent regulations. Erection of the old buffalo type of mill was prohibited and the installation of modern machinery made compulsory. Such radical measures of reform naturally provoked criticism and opposition from the owners of native factories, but they soon perceived that their real interests laid in adopting modern methods. Injustice sometimes crept in as the result of the government's policy to hasten the development of the industry by encouraging the formation of big companies to undertake the growing of cane on a large scale, but on the other hand, the policy was broad and liberal, especially in the matter of subsidies and assistance in various forms not only in planting but for the erection of mills. The liberality of the sugar bureau may be judged from the fact that in several instances mills obtained a subsidy of six per cent. on the paid up capital for a period of five years or assistance in the shape of a lump sum of twenty per cent. on the total value of the plant. Notwithstanding these liberal inducements to progress, the Chinese farmers (noted as being more conservative and backward than their compatriots on the mainland) refused to co-operate, compelling the government to take drastic measures to ensure the success of its experiment. In 1905, therefore, special regulations for the control of sugar mills along the lines of a law then in force in the Dutch East Indies, were placed in operation.

Under these regulations any person wishing to erect a modern style sugar mill had to obtain the permission of the director of the sugar bureau, and when that permission has been granted the director fixed the district within which the mill was allowed to collect cane for the use of the mill. When the limits of such a district were fixed or altered a notification is published in the official gazette of the Formosan government to that effect. These



The Kohekirin Mill of the Formosa Sugar Company

regulations also provided that the farmers who occupy or cultivate land within any district allotted to a sugar mill, approved of by the sugar bureau, must sell all their cane to that mill, and no other mill may be erected within this allotted district. This meant, of course, that the sugar mill in any given district had a monopoly of the cane grown there by the farmers, who, moreover, were forbidden to sell their cane to any other district, or to use their cane for the manufacture of any other material except sugar.

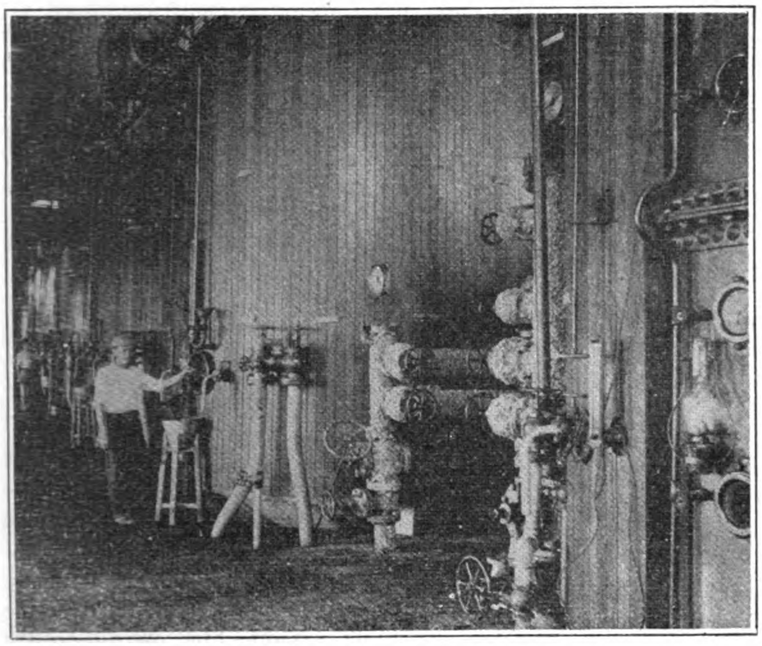


Cane Unloader at the Kyoshito Mill

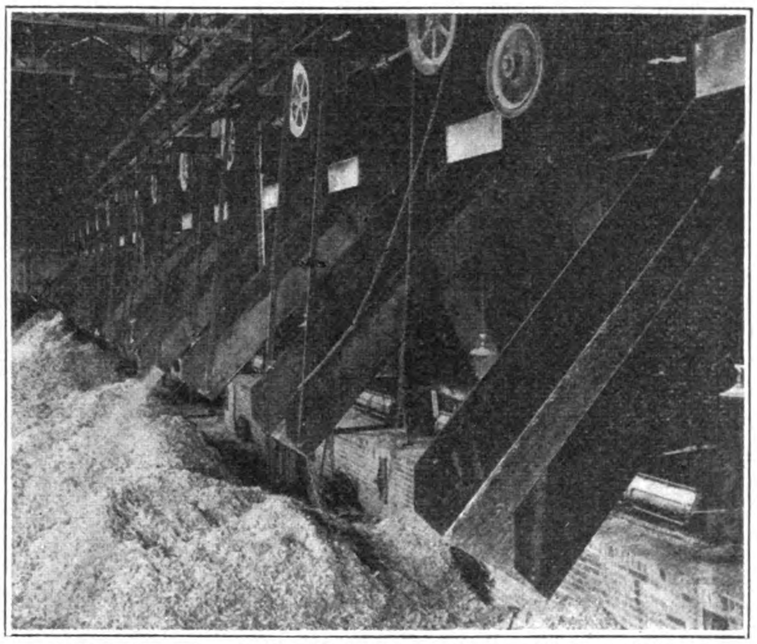
Under the regulations of 1905 nine modern mills sprung up in two years, with a total paid-up capital of over Y.17,500,000. The regulations had the effect of quadrupling the plantings in only three years.

All the new mills were erected without any subsidy or assistance from the government, and as the sugar bureau had justified its existence and attained its objects, it turned its attention to the encouragement of the planting of a better class of cane.

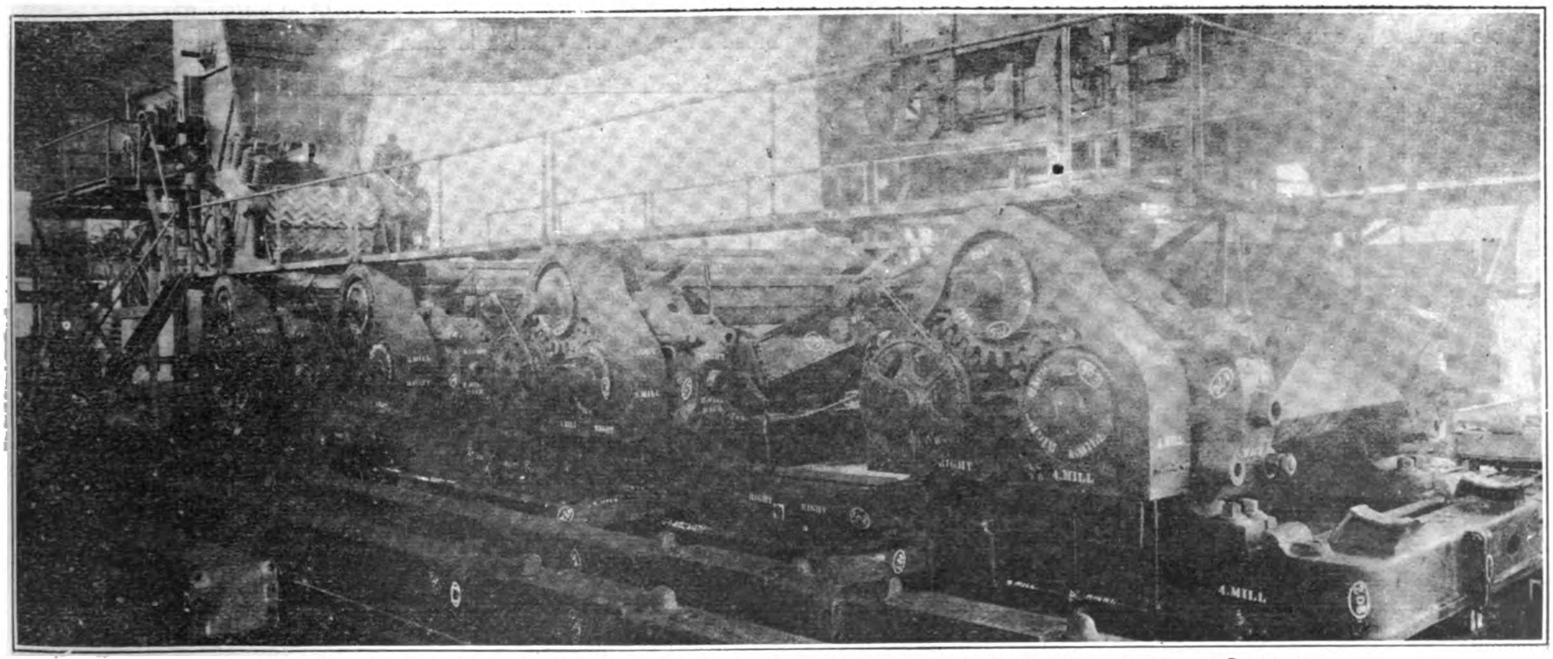
The native species of cane had so deteriorated in sugar content that it required little effort on the part of the authorities to encourage the cultivation of the better plants, the seed for which was imported from Hawaii, Java and Australia. Together with the improvement of the cane, irrigation projects were carried out and steam plows imported. On the Kohekirin estate several sets of Fowler steam plows worked by cable were placed in operation obtaining the same excellent results as followed the use of these



Vacuum Pan Floor of the Ako Mi



Boiler Room in the Ako Mill Showing Bagasse Feed to Boilers and Excess Fuel Shutes



12 Roller Mill and Krajewski Crusher built by the Honolulu Iron Works for the Formosa Sugar Company

machines in Cuba and other large cane-producing countries. The rapid improvement of the cane species was followed by a considerable extension of area under cultivation. In 1908 there were 68,645 acres under cane, of which 28,055 were planted with native varieties and the remainder with improved and imported canes. By 1910, the area had increased to 162,108 acres and the yield per acre increased by 13 per cent. where formerly this had averaged only 8 per cent., with an improvement of nearly five per cent. in the amount of sugar extracted from the cane. The area under cultivation in 1917 was over 281,890 acres yielding over 700,000,000 pounds of sugar per year.

Formosa Sugar Company: Private Railway Bridge, 5,300 feet long over the Tamsui River

An official Japanese bulletin on the sugar industry issued at the beginning of last year, gives the number of modern mills in Formosa as 40, with an aggregate capacity of 30,000 tons of cane per day. The output was formerly confined to centrifugal sugar for the Japanese refineries, but white sugar is now being turned out at many of the larger mills and finds its way direct to the consuming market. The output of these mills, says the official bulletin, is often restricted because cane planting gives way to rice when prices for this latter commodity are high, and also because of weather disturbances.

This observation bears out the statement of Mr. George Fairchild of Manila, to the effect that the sugar crop of Formosa is incapable of much further expansion because of the demands upon the land for the more necessary life giving staple. This weight upon the expansion of the industry will grow heavier as the years pass and still further reduce the area of lands available for sugar cultivation.

A Formosan Cane Field

So far as can be ascertained practically all the available sugar cane districts in south Formosa have been allotted under the sugar laws to various central factories. Outside of some 10,000 acres on the east coast of the island there is little land available for the further profitable expansion of the industry.

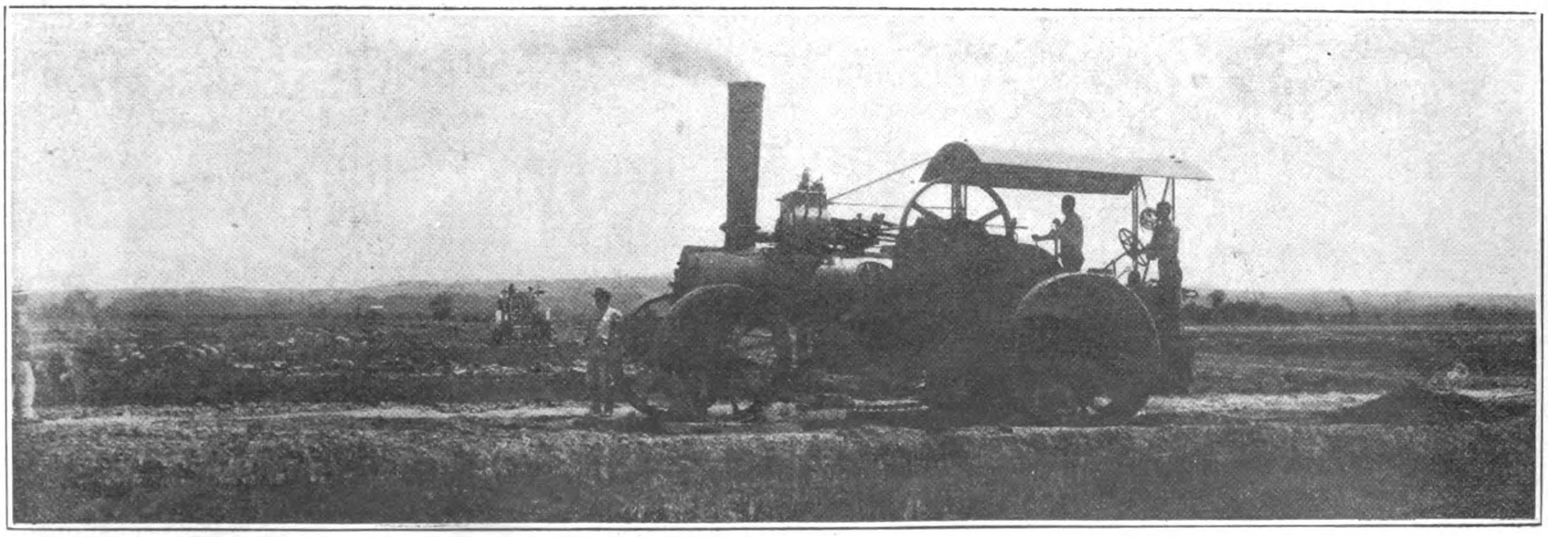
The official bulletin gives the following table showing the output of sugar in Japan proper and Formosa for the ten years ending 1919:—

(In Thousands)

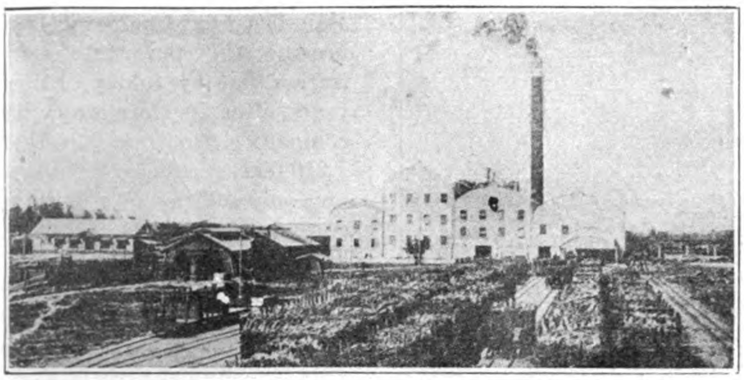
Year	In Jap. Proper.	In Jap. Total.	
	Pcls.	Pcls.	Pcls.
1910	1,051	3,404	4,403
1911	1,112	4,506	5,618
1912	1,121	2,926	4,047
1913	1,167	1,192	2,359
1914	1,451	2,513	3,964
Average for the above five years	1,180	2,908	4,028
1915	1,157	3,474	4,631
1916	1,601	5,351	6,952
1917	2,141	7,635	9,776
1918	1,421	5,735	7,156
Average for the above four years	1,580	5,549	7,129
1919	1,618	4,863	6,481

The last report of the Bank of Taiwan for the period ending June 30 ultimo, gives the output of sugar for the 1920-21 season at 4,000,000 piculs, an increase of 500,000 piculs over the preceding season, but owing to the decline in prices the loss on the crop amounted to Y.50,000,000.

Marked as has been the progress of sugar production in Formosa in recent years, it is still far behind the rate reached in Java in some essential particulars. The yield of sugar per acre in Formosa averages only one and a half tons, against an average of five



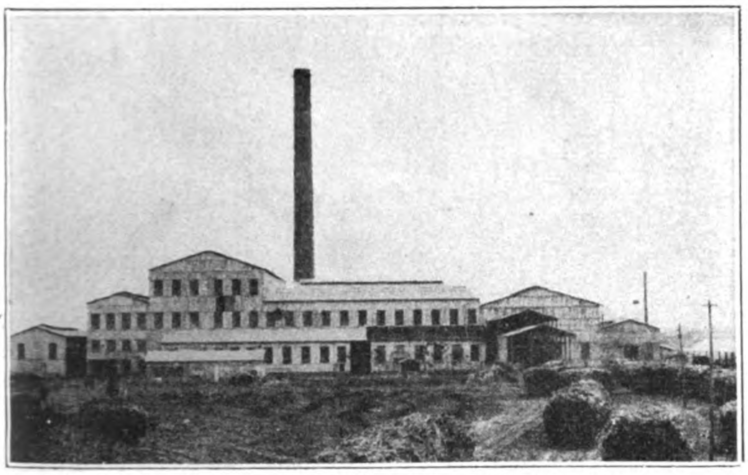
A Fowler Steam Plow on the Kohekirin Plantation



The No. 1 Mill of the Meiji Sugar Mfg. Co., Ltd. at Shorosho, Formosa

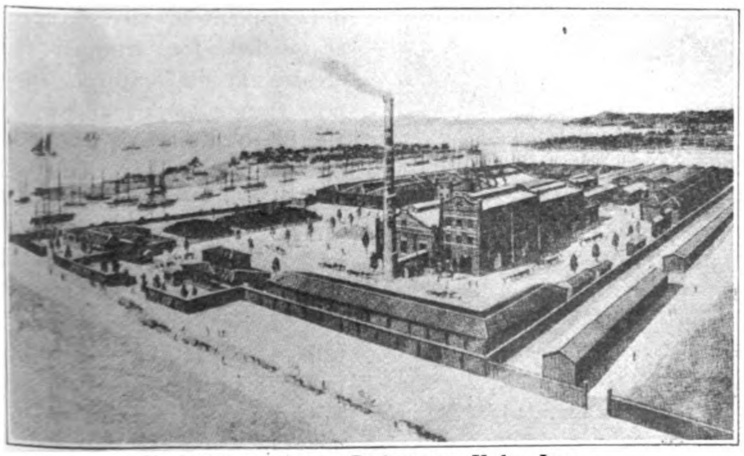
tons to the acre in Java and the Hawaiian Islands, a difference due largely to better irrigation and rotation of crops or permitting the land to lie fallow, whereas in Formosa the land is pushed to its limit of production and irrigation is inadequate. Wages in Java are also much lower, while Formosa enjoys a protective tariff of Y.3.10 per picul.

The equipment of the Formosan mills make up for many draw backs in other directions. The best machinery that can be procured has been installed irrespective of nationality of makers,



The Hokko Factory of the Oriental Sugar Mfg. Co. of Formosa

and, whereas the Honolulu Iron Works holds the record for the number of American mills erected there are many equally fine plants equipped with British machinery. The Harvey Engineering Company, one of the foremost manufacturers of sugar machinery in Great Britain have erected several mills and the Mirrless Watson Company, Ltd., have also some fine installations to their credit. All of the larger Formosan centrals are equipped with multiple mills and crushers, in which the maximum percentage of juice is extracted from the cane. The same excellence of equipment is

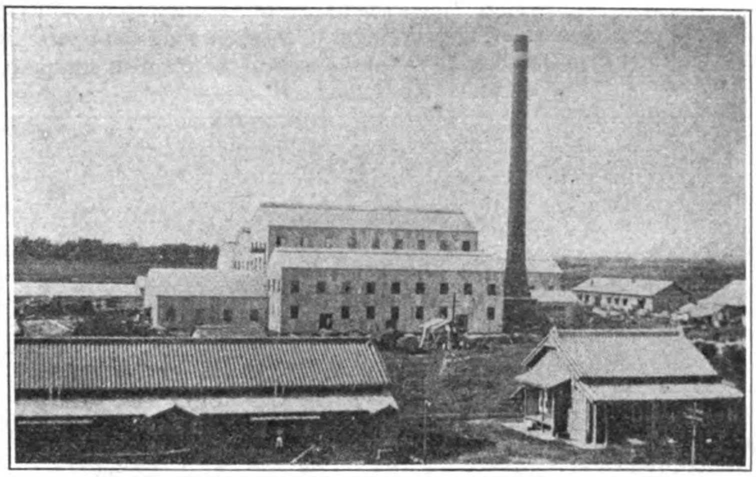


The Imperial Sugar Refinery at Kobe, Japan

found throughout all the various departments of defecation, clarification, filter presses, multiple effects, vacuum pans, crystallizers, centrifugals, cane loading and unloading devices, etc.

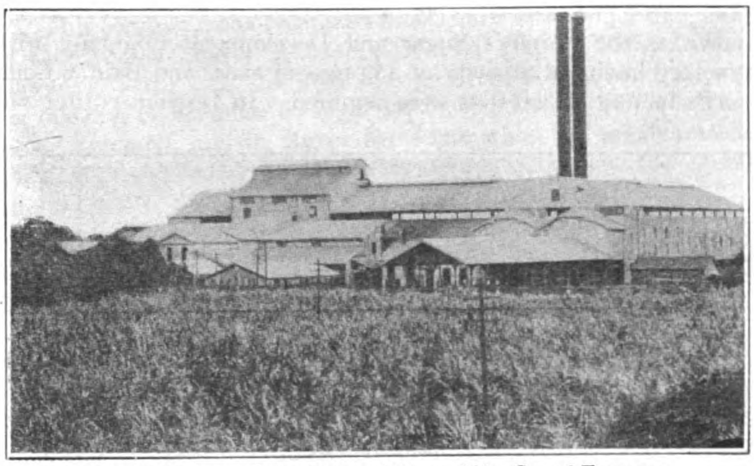
Taiwan Sugar Manufacturing Company

The most important of the Formosan sugar companies is the Taiwan Sugar Manufacturing Company, Ltd., more generally known throughout the Orient by its Japanese name of the Taiwan Seito Kabushiki Kaisha. This company was originally formed in December 1900, with a capital of Y.1,000,000, half paid up. The sugar market in Japan then offered every inducement for such an enterprise, as apart from the small output of some of the southern islands, Japan was entirely dependent upon foreign grown sugar. Formosa was an ideal sugar country and any Japanese



The No. 2 Mill of the Ensuiko Sugar Company, Formosa

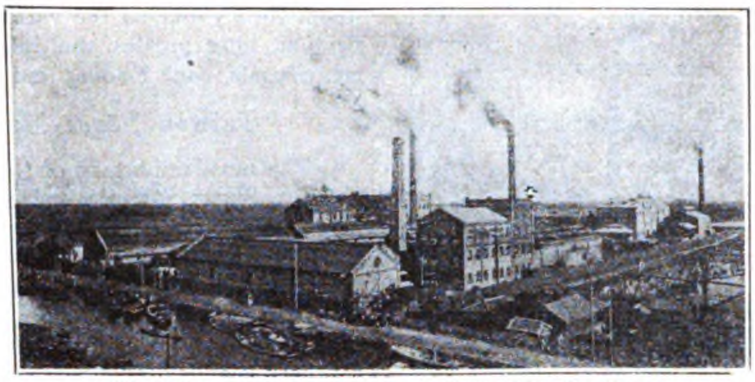
company that could overcome the initial difficulties was certain of success. The president and manager of the newly created company went to Formosa to inspect and report on the adaptability for sugar cane cultivation of the fields in the provinces of Ako and Tainan. They decided to make a start with a small factory of about 250 tons of cane per day and purchase the cane from the farmers along the same lines as the central factories of Cuba and elsewhere, but this plan had to be abandoned as it was seen to be



Nansei Factory of the Oriental Sugar Mfg. Co. of Formosa

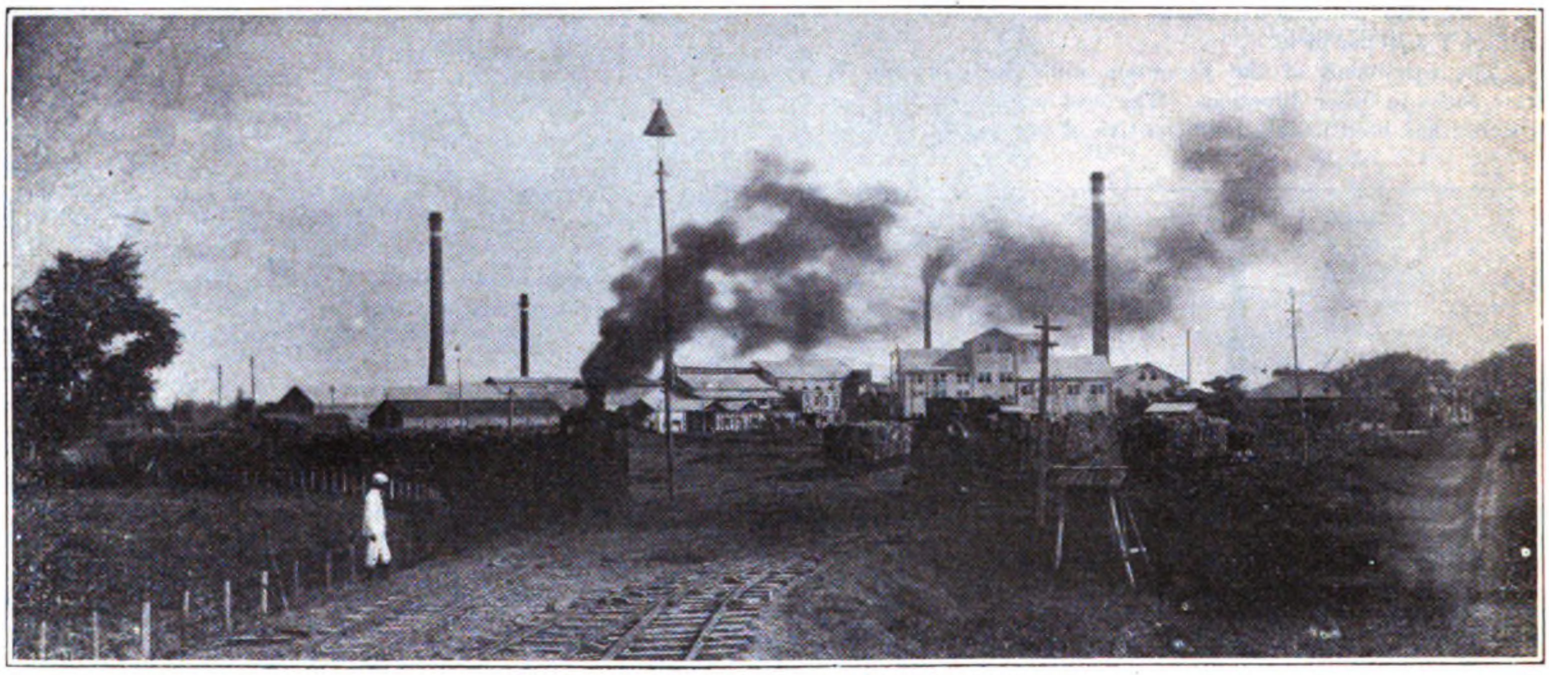
more profitable to purchase the land and cultivate the cane themselves. The new project was put before a meeting of the shareholders on January 5, 1901, and it was resolved to call up the balance of the capital (Y.500,000) and devote the money to the purchase of about 2,450 acres. This venture was not entirely successful owing to the poor selection of seed, the prevalence of fever amongst the laborers, and the exposure to attacks by aborigenes and bandits. A very difficult period was experienced before the production of cane and sugar became regularized. In August 1906 it was decided to

increase the capital to Y.5,000,000 and erect other factories. The success of this company soon attracted others into the field. The Daito Sugar Manufacturing Company was established at Ako, with a capital of Y.5,000,000, the majority of the shares being subscribed by the shareholders of the Taiwan Company. The amalgamation of the two companies took place in April 1908, and 9,000 shares of the joint stock of Y.100,000,000 taken up by the imperial household department. The reorganized concern then bought out the Taiwan Sugar Manufacturing Company in August of the following year. Subsequently, the English company, known as the Formosa Sugar and Development Company, with a factory having a capacity of 850 tons of cane, and Bain & Company's factory of 300 tons were acquired. In December 1911 the Kobe Sugar Manufacturing Company was absorbed at a cost of Y.950,000. By these purchases and amalgamations the Taiwan Sugar Manufacturing Company, Ltd., became the powerful organization that it is to-day. Eleven years after its formation the company's output reached 1,210,000 piculs, which was not only sufficient for domestic consumption but permitted export to other Far Eastern countries. In July 1914 the Horisha Sugar Manufacturing Company, and in September 1916 the Taihoku Sugar Company were amalgamated with the larger Taiwan Company.



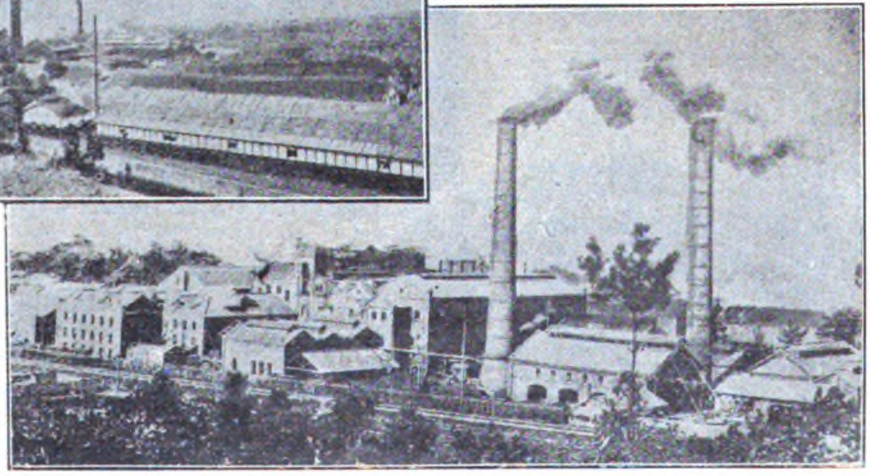
The Tokyo Refinery of the Japan Sugar Mfg. Co., Ltd.

To-day, the Taiwan Company owns and operates ten mills, eight in South Formosa, one in the centre of the island and one in the North. The mill at Ako is the largest, with a capacity of 3,500 tons of cane per day. In addition, there are two alcohol distilleries in southern Taiwan, and two refineries at Kobe. The total acreage under control of the company is over 36,500 acres. It has over 400 miles of private railways for cane transportation, with wharves, lighters and other minor plants. Of the 400,000 tons produced by twelve companies of Formosa, the Taiwan Company alone turns out over 120,000 tons, or about 30 per cent. of the total, and it produces about half the alcohol used in Japan. The development of this company as called for frequent increases in its capital, which now stands at Y. 29,800,000. Mr. Shiro Fujita is chairman of the board of directors, with Mr. T. Yamamoto as senior managing director and Mr. T. Takechi and Mr. T. Masuda as managing directors. The sale of the products of the company is in the hands of the Mitsui Bussan Kaisha as sole agents.

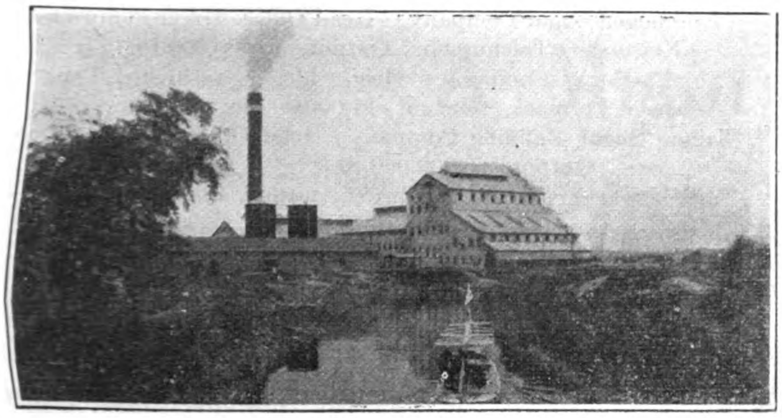


The Kyoshita Mill of the Formosa Sugar Company

Osaka Refinery of the Japan Sugar Mfg. Co., Ltd.



The Dairi Refinery of the Japan Sugar Mfg. Co., Ltd.



The Kobekirui Mill of the Formosa Sugar Co.

The Oriental (Toyo) Sugar Manufacturing Company

This company was established in 1907 with a capital of Y. 5,000,000 and at once began planting on an extensive scale, turning out 1,000 tons of sugar the first year and 2,000 tons the next. A year after its organization, the profits were Y.673,000 on an income of over Y.2,000,000. This company also started in to absorb its smaller neighbors and the Toroku Sugar Company was taken over in 1914, increasing the capital by Y.1,200,000, and several other smaller companies followed in 1915. The Hokko and Tamaki Sugar Companies were absorbed in 1916, bringing the total subscribed capital of the Oriental Company up to Y.11,750,000.

The Oriental Company has extensive plantations and large up-to-date mills. Its head office is at Nanseisho, Kagi prefecture, Formosa, with a Tokyo office in the Mitsubishi building. Mr. T. Shimosaka is president, with Messrs. Goro Matsukata, K. Komatsu, K. Fujita, S. Matsukata, R. Hyuga, R. Oka, S. Ishikawa and T. Tamura as directors.

Meiji Seito Kabushiki Kaisha

This company, more generally known as the Meiji Sugar Manufacturing Company, started its factory at Shoro in Formosa in December 1908, with a capacity of 750 tons of cane per day. The Santaw factory with a capacity of 1,000 tons was established in November 1910, and the Soya factory at Tainan with a capacity of 1,000 tons of cane per day in January 1912. At the same time, the company turned its attention to refining, and in January 1912 an amalgamation was effected with the Yokohama Sugar Refining Company and the capital incréased to Y.10,000,000. Refining was begun at the Kawasaki Refinery, in Kanagawa prefecture, with an output of 200 tons of refined product per day. In July 1913 the Chuo Sugar Manufacturing Company with a plant at Nanto, Formosa, having a capacity of 750 tons of cane per day was absorbed, and the capital increased to Y.12,000,000. As the export trade began to assume large proportions which the Kawasaki Refinery was unable to meet, the Tobata Refinery was established in Fukuoka prefecture in July 1916 with a capacity of 100 tons of refined sugar per day. The maufacture of bye-products was entered into, and at the Santaw mill a large distillery was installed to make alcohol from the molasses. The Kawasaki Refinery is now equipped to turn out cube and powdered sugar. The capacity of the properties belonging to this company is over 3,500 tons of raw sugar per day, of refined sugar about 300 tons and 280,000 gallons of alcohol per year. The company is also considering the manufacture of confectionery and condensed milk. The president of the company is Mr. H. Soma with offices at No. 1 Yurako-cho Kojimachi-ku, Tokyo.

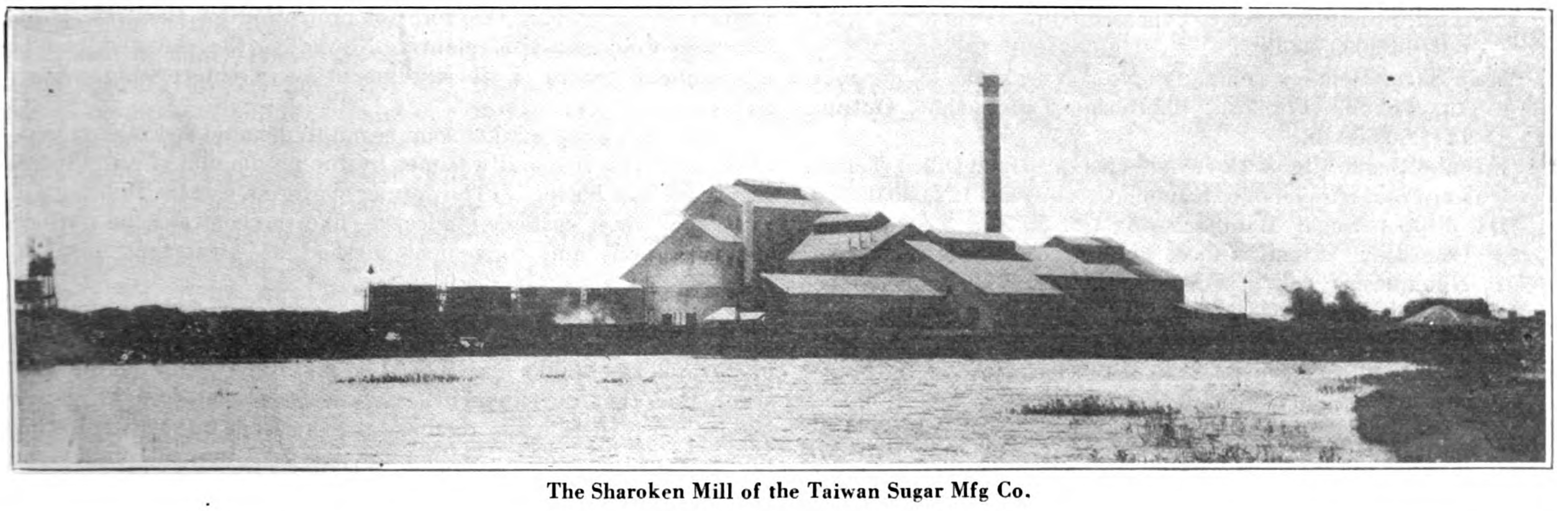
Imperial Sugar Company, Limited

The Imperial, or Teikoku Seito Kabushiki Kaisha, holds a prominent position in the sugar industry of Japan. The founders of this company Messrs. K. Abe, H. Yamashita and S. Matsukata, started in October 1910 with a capital of Y.5,000,000 which has since been increased to Y.15,000,000. It now operates five mills in Formosa situated as follows: Nos. 1 and 2, at Taichu; No. 3, at Tanshiken, Taichu; No. 4, at Suidensho, Shinchiku and No. 5, at Sankatutensho, Shinchiku. Alcohol distilleries are located at Taichu and Suidensho in the Shinchiku district. A large and well-equipped refinery is operated at Higashi-Shirike, Hyogo, near Kobe.

The total output of the five mills is over 2,500 tons of sugar per day. The company is engaged in all branches of the sugar industry and actively associated with the transportation business of the island where it operates the following railway mileage: 38 miles at the Taichu mill, 17 miles at the Shinchiku and two miles at Tanshiken, with an equipment of ten locomotives and nearly 600 freight cars. General passenger and goods traffic is handled over a distance of ten miles between Taichu and Mantoroku with a hand car service for another distance of 28 miles. They also operate their own fleet of steamers. The president and managing director of the company is Mr. S. Matsukata with head offices at No. 14 Taichu, Formosa, with a Tokyo branch at No. 1 Ginza, Shichome, Tokyo.

Japan Sugar Manufacturing Company, Limited

This company was organized in January 1896 under the name of the Nippon Seisito Kabushiki Kaisha (Japan Refined Sugar Company, Ltd.) with the modest capital of Y.300,000, but with the opening of Formosa to sugar cane cultivation, the capital had to be increased, and in November 1906, when an amalgamation was made with the Japan Sugar Company of Osaka, the capital was raised to Y.12,000,000, and the present name adopted. In August of the following year, the Dairi Sugar Refinery was



The Sharoken Mill of the Taiwan Sugar Mfg Co.

purchased and gave the company its present premier position in Japan's sugar trade.

In 1908 the first mill was erected at Gokenseki, Kagi prefecture, Formosa, and a second mill in 1912. With the two refineries in Tokyo and those in Osaka and at Dairi, the company has a daily capacity of over 850 tons of refined sugar, in addition to the output of rock candy, alcohol in Tokyo and cube sugar in Osaka. The two mills in Formosa have a capacity of 2,200 tons of sugar per day drawing their cane supplies from an area of over 180,000 acres, of which, 6,000 acres are cane lands belonging to the company. More than 111 miles of railways are operated for the exclusive use of the company.

The present capital of the company stands at Y.18,000,000 with Mr. Raita Fujiyama (president of the Tokyo chamber of commerce) as president, and Messrs. N. Takayawa and R. Ito as managing directors. The head office of this company is at No. 12 Sanchome, Kakigara-cho, Nihonbashi-ku, Tokyo.

Dairi Sugar Refinery

The Dairi Sugar Refinery of the Japan Sugar Manufacturing Company is located within ten minutes tramway ride from the port of Moji and covers about 35,000 *tsubo* of land. The machinery is from the best American and British makers, the power plant being operated by two engines from Harvie & Company, with Babcock & Wilcox boilers, two General Electric generators and several motors. It gives employment to 250 laborers and an clerical force of 50. The annual output is over 1,300,000 piculs, of which the larger part is exported to China where the company has carefully studied the requirements of the market. The raw product is imported not only from Formosa, but from the Philippines, Java and Cuba. The South Seas, India, Russia and other parts of Asia are large purchasers of the refined products of this company, which are marketed through well-known Japanese firms, such as Mitsui Bussan Kaisha, Suzuki & Co., Yuasa & Co., Fukuwaya Co., Okura & Co. and Abe Companies. The general manager of the refinery is Mr. K. Akiyama.

The Ensuiko Sugar Manufacturing and Development Company

This company was established by Mr. Osetsuno in 1903 with a capital of Y.300,000. It was afterwards reorganized with a capital of Y.7,875,000. The company operates two mills with private railway system, turning out about 18,000,000-lb. of raw product per annum. Its head office is at Shinyei-cho, Kagi prefecture, Formosa, with a branch at Tokyo. President, I. Arai; Managing Directors, T. Maki and S. Fujisaki.

The names of the various companies operating mills in Formosa are as follows:

*Taiwan Sugar Refining Company, Ltd.: Head Office, 22 Honkokucho-Nihonbashi-ku, Tokyo. Formosa, Kyoshito-sho, Tainancho. Output, 219,970,000-lb.

*Oriental Sugar Manufacturing Co.: Head Office, Nanseisho, Kagi, Formosa. Tokyo Office, Mitsubishi Building. Output, 146,000,000-lb.

*Meiji Sugar Refining Company: No. 1 Yurakocho, Kojimachi-ku, Tokyo. Formosa, Shoro-sho, Tainan-cho. Output, 121,000,000-lb.

*Ensuiko Sugar Mfg. & Development Co.: Head Office, Tokyo. Formosa, Shinyei-cho, Kagi-cho. Output, 122,000,000-lb.

*Dai Nippon Sugar Manufacturing Co. or The Japan Sugar Co., Ltd.: Head Office, 12 Sanchome Kakigaracho, Nihonbashi, Tokyo. Formosa, Gokenseki-sho, Kagi-cho. Output, 91,000,000-lb.

*Taihoku Sugar Company (Imperial Sugar Co.): Head Office, 14 Taichu, Formosa. Tokyo Branch, 1 Ginza Shichome. Output, 82,000,000-lb.

*Niitaka Sugar Manufacturing Co.: Head Office, Tokyo. Formosa, Chikuishi, Churyo-sho, Taichui-cho. Output, 67,000,000-lb.

*Rinhongen Sugar Company: Head Office, Tokyo. Formosa, Keisu-sho, Taichu-cho. Output, 40,000,000-lb.

*Shinko Sugar Company: Head Office, Sanshicho, Tainancho. Formosa. Output, 14,000,000-lb.

Tainan Sugar Refining Company: Head Office, Tainan, Formosa. Output, 20,000,000-lb.

Taito Sugar Refining Company: Output, 4,000,000-lb.

Those marked with asterisk (*) operate plantation railways.

Romance in a Tank

NOWHERE in the world have long-established manufacturing companies had more interesting histories than those presented by certain American firms. The development of the iron and steel industry is a typically American story, and the histories of companies whose fortunes have been linked therewith reflect the commercial prowess characteristic of the greatest drama in the American industrial arena. A pioneer in this field was a Chicago builder of bridges and tanks. In 1865 steel tanks were already in limited use, but in that year this inventor produced a new type—with a self-supporting bottom—and organized a company to manufacture it.

Thereupon the Chicago Bridge & Iron Works began to revolutionize the elevated tank industry. The new principle of the hemispherical self-supporting bottom marked the invention as something much more important than a mere steel imitation of the ordinary wooden tank. This principle meant the elimination of the expensive grillage neceassary to support flat bottoms. It meant the reduction of cleaning and upkeep costs. It meant that danger from leakage and bursting practically ceased. In short, the erection in 1892 of the first elevated steel tank with a self-supporting bottom, marked a milestone in the history of modern engineering.

This invention was produced at a time of phenomenal industrial expansion. It was therefore assured a market which grew by leaps and bounds, at home and abroad, until to-day thousands of elevated steel tanks are seen in every quarter of the globe. The new industrialism drew increasing number of people into the cities, and the problems of sanitation and general water supply became acute. Modern sanitary engineering made increasing use of the elevated steel tank for municipal water storage. The problem of the protection of property—the fruit of all this commercial prosperity—from fire, became pressing. The timely invention of the automatic sprinkler system offered another use for steel tanks.

Against this tremendous tide of industrialism a new interest in human welfare was meanwhile making headway. A growing sympathy for the less fortunate classes of society—the public wards in asylums and poor-houses—and a recognition of their human rights, made the use of facilities for fire protection popular in public institutions. Many automatic sprinkler systems have been installed in response to this demand.

The growing regard for both life and property led many cities to pass laws requiring this form of protection for theatres, public buildings and industrial plants. Nowadays the elevated tank is a prominent feature of the sky-line in every enterprising municipality.

The expanding market soon began to demand specialized types of tanks. This demand was met by the production of an elliptical and a conical bottom. The former performs certain functions in municipal water systems, and also—like the conical type—affords an expeditious and convenient method of "watering" railway engines.

Thus the Chicago Bridge & Iron Works answered the challenge of a developing industrialism. The production of specialized types of elevated steel tanks may indeed be said to have in some measure stimulated that development. Certain it is that to-day in both hemispheres there rises against the horizon an ever-spreading forest of these symetrical monuments to American engineering genius.

A Mighty Enterprise

The Phosphate of Lime Industries of the Central Pacific
The Amazing Story of Ocean and Nauru Islands

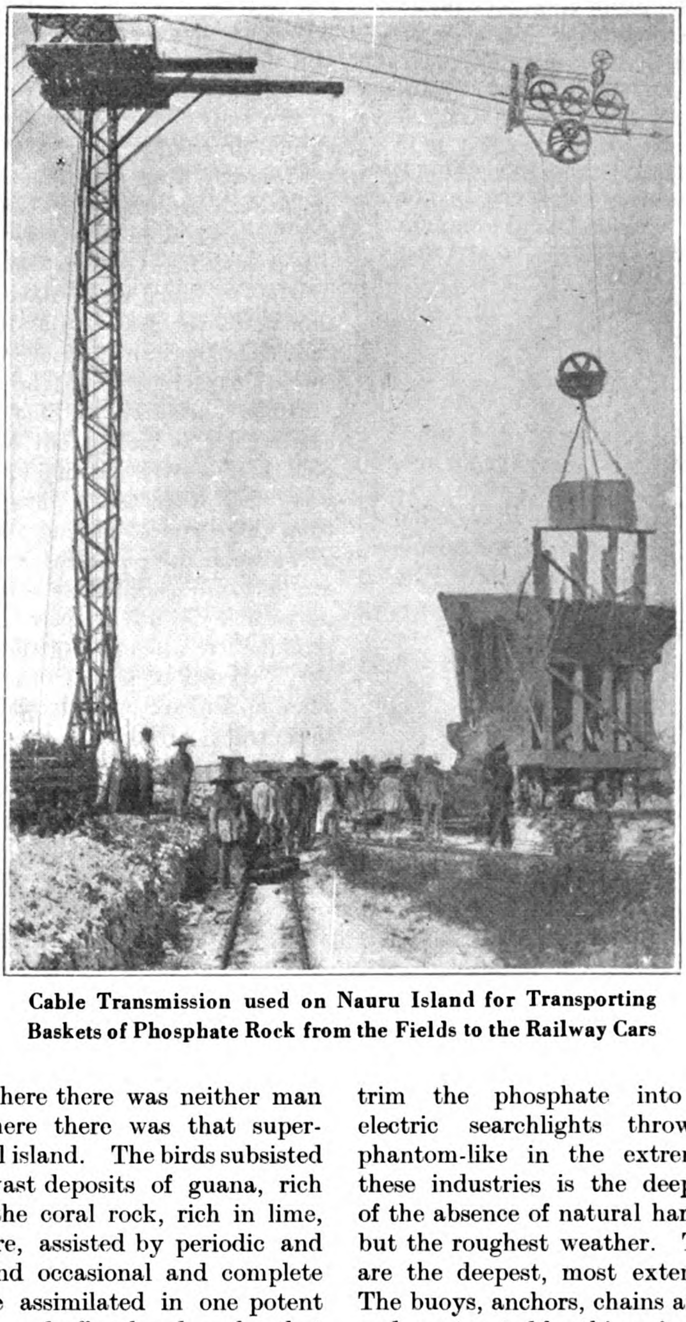
Written and illustrated by Thos. H. McMahon, F.R.G.S.

THERE is no exaggeration in the opinion that in the history of enterprise there is to be found no more impressive demonstration of pluck and endeavor that in the truly up-to-date wonderful and interesting phosphate-of-lime industries of Ocean and Nauru Islands, of the Central Pacific. Ocean Island is but 1,000 acres in extent and Nauru 5,000 acres, both islands lie in Latitude 0 degrees 52 minutes S. and longitude 169 degrees 35 minutes E. both are within 50 miles of the equator and are 160 miles apart. These islands—the first British and under British administration, the second formerly German but now under mandate given to the British empire and governed by Australia, are nature's store houses of a very high-grade phosphate of lime, a magic plant food and general fertiliser.

By the magnitude of its operations this enterprise has given a significant value and importance to the Central Pacific, a little-heeded, little-known part of the globe.

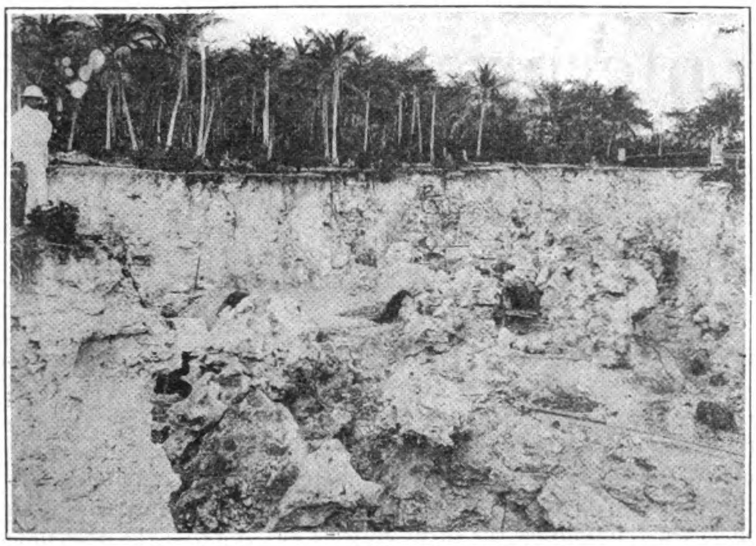
A thousand people, white, yellow and brown are engaged in this industry and increasing trade will soon necessitate the employment of many hundreds of extra hands. The greater number of white employees are British, Scotch and Irish, but there are also many Americans and Australians. There are some three hundred of Gilbert Island natives, some three hundred Chinese at Nauru, these supplemented by hundreds of natives from the Marshalls, and the Carolines groups and a small number of Nauru islanders.

The bounteousness and wonders of nature are shown in the composition of this magic product phosphate of lime. For years—it is impossible to compute how many—countless numbers and generations of sea birds were attracted to these two tiny islands, where there was neither man nor animal to disturb them, and where there was that superabundance of fish usual to deep sea coral island. The birds subsisted to repletion on the fish, and created vast deposits of guana, rich in phosphate, which, mingling with the coral rock, rich in lime, and by the powerful process of nature, assisted by periodic and alternate droughts, copious rains, and occasional and complete submergings by the sea waters, were assimilated in one potent chemical factor—phosphate of lime, a buff colored rock, that contained the all-essential virtues of a prime fertiliser. To-day there is scarcely a bird to be seen on these islands, but there remain a rich treasure handed over to the use and ingenuity of men.

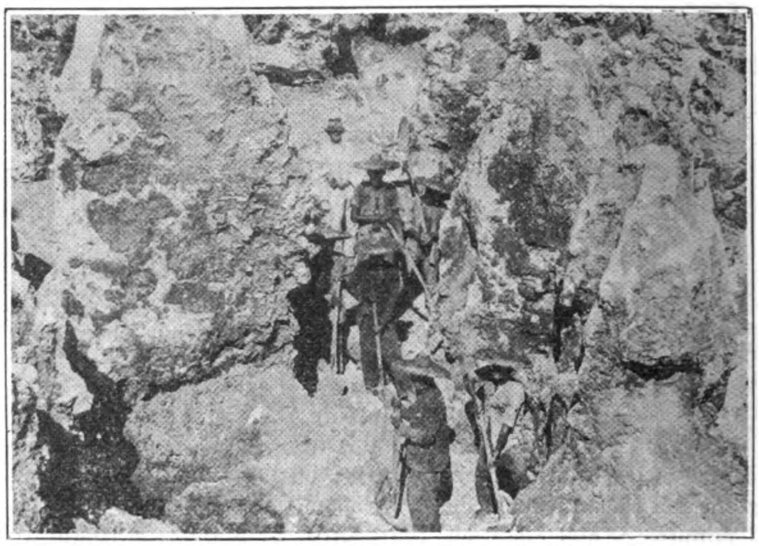


Cable Transmission used on Nauru Island for Transporting Baskets of Phosphate Rock from the Fields to the Railway Cars

How many people will credit that in the silence, the vastness, of the little-known Central Pacific two modern towns have been upreared, two settlements of industrial activity having every convenience and comfort of civilized life and throbbing with the energies of a great modern enterprise! Day and night there are the crash and buzz of heavy machinery, the clangour and din of many workshops, the beats of steam hammers, the roar of furnaces from smithies and foundries, the shrill sirens of locomotives, the deafening rumble and rattle of phosphate-laden trucks rushing across overhead bridges or along busy railroads, bringing from the fields the precious phosphate rock to crushers, dryers and enormous storing bins, there to be ready for prompt distribution to the very ends of the earth. Striking features of the magnitude of the industry at both islands are the immense spider-like cantilever jetties fronting the settlement bestriding the reef, and breasting to the full the open sea, sometimes turbulent, and the sudden changes of winds making the loading of steamers under such conditions a work of great skill and some difficulty. This loading is also interesting, and, when a steamer is standing by, goes on night and day without a break. An endless circle of surf-boats with three shifts of men plies between the jetties and the steamer each carrying cane baskets capable of holding, per load, nearly three tons of phosphate. The boats pass under the end of the jetties, and from great shoots the phosphate is dropped into the baskets in a most expeditious manner. Thus laden, they are tugged off to the steamer by powerful launches, the baskets hauled up, and capsized into the holds of chartered 7,000-ton steamers. Natives, ghost-like in appearance from the fine cream colored dust that pervades the atmosphere, load the boats and trim the phosphate into the ships. At night, with the electric searchlights thrown over the scene, the effect is phantom-like in the extreme. A very distinctive feature of these industries is the deep-sea moorings necessary on account of the absence of natural harbors, and permitting of loading in all but the roughest weather. The moorings are remarkable, as they are the deepest, most extensive, and most costly in the world. The buoys, anchors, chains and cables are of gigantic size, designed and constructed for this unique system. It will be a surprise to the reader to learn that on these two tiny islands there is a network of well-laid railroads, steam and electric about 100 miles in all, the lines traversing the intensely picturesque phosphate fields, weirdly



A Phosphate Field at Nauru Island



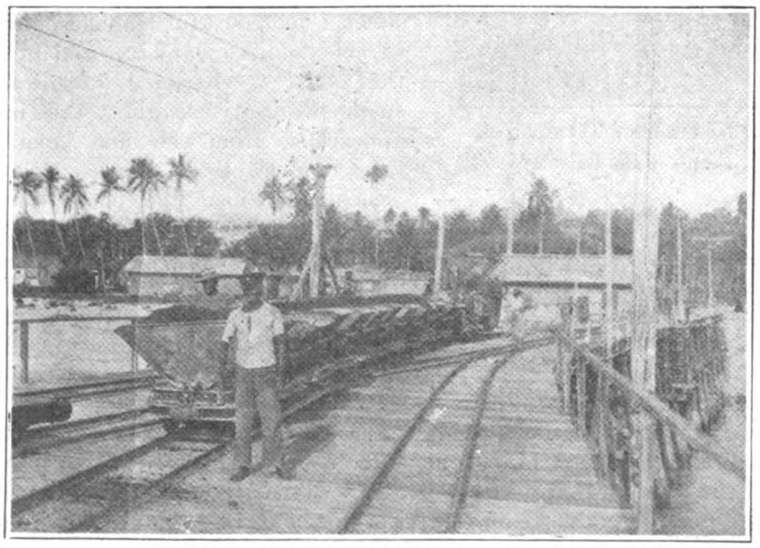
Chinese at Work in a Nauru Island Phosphate Field. They are Prized Laborers

conspicuous in the form of spectre-like and gaunt coral rock pinnacle that obtrude in thousands in the worked out beds. Some of these pinnacles, church-steeple style, tower to heights of thirty to fifty feet. They are weathered to an extraordinary degree of sharpness, having tips so fine as to appear needle-pointed.

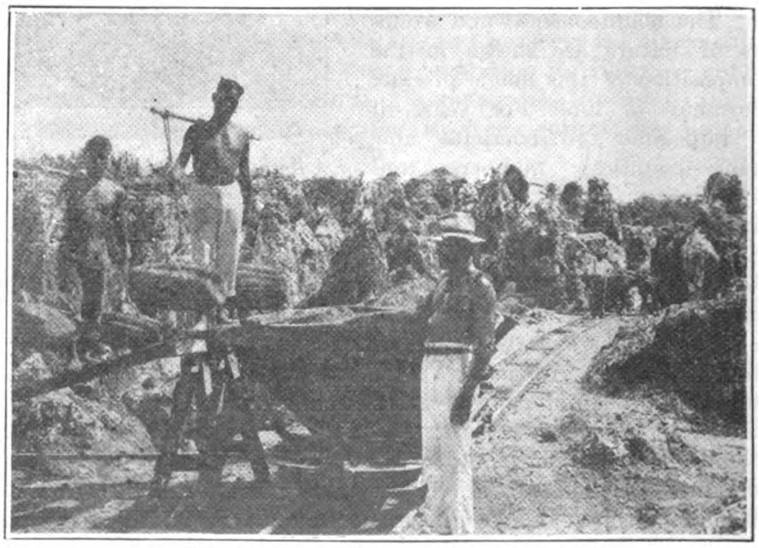
Quite a romance is attached to this phosphate of lime enterprise of the Central Pacific. Many years ago, a now defunct, but once justly famous, commercial concern, the " Pacific Island Company " had a small unpretentious office in one of the side streets of Sydney, New South Wales, Australia. A peculiar looking piece of rock served as a check to keep the office door open. It was tossed here, kicked there, examined curiously by some, but unheeded by most passers-by. A member of the Company's staff one day, who knew something of guano and phosphate rock, took it up, examined it, and subjected it to a chemical test, and as a result of an investigation was set afoot to trade the origin of the insignificant bit of buff-colored rock. A sailor had picked it up on Ocean Island thinking " what a fine stone it would be for making marbles for schoolboys." It proved, however, to be the key to a rich storehouse of nature and to treasure islands in the Pacific. Experts visited the island, and it was quickly realized what possibilities were in phosphate-of-lime as a fertiliser. These possibilities were worthy of a great commercial undertaking, and the first offer to work the phosphate field was made to Australian capitalists who turned it down as having no commercial value. The venture, however, was very eagerly seized by a financial British Company. The setting up of an industry on Ocean Island was an undertaking with heavy expenditure, attended by all the disabilities of inexperience, and made more difficult by the extreme remoteness of the island. But the years of rick passed, the enterprise prospered, and the great fertiliser dug and blasted from the coral rock has gone and is going to the ends of the earth, revitalizing over-used and impoverished agriculturaf lands.

Shortly after the industry at Ocean Island was set in motion, attention was directed to the island of Nauru, adjacent and found also holding large deposits of high-class phosphate of lime. The island was then German-owned, and its valuable product was untouched. Nauru would have remained a waste but for the exploration and overtures of the British Company. British persistency succeeded, and an industry began on the island under terms and conditions agreeable to the German government.

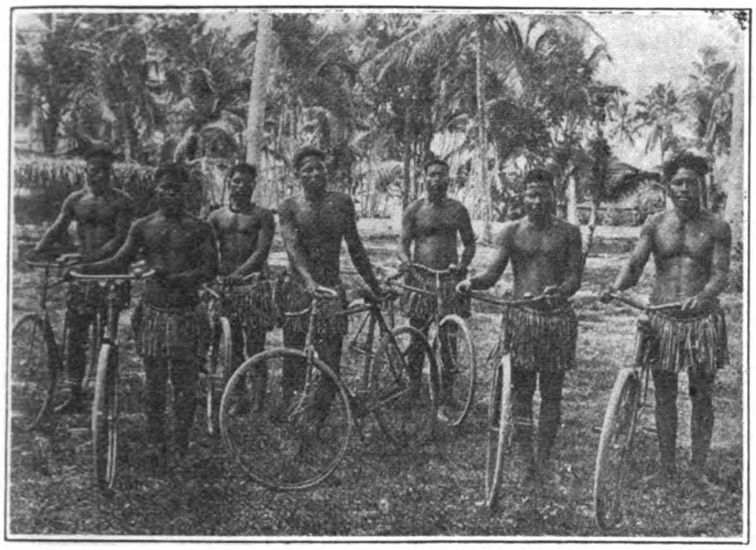
The phosphate of lime is of two classes—rock and alluvial. The former is blasted out, while the latter can be removed with pick and shovel. Every detail is carried out in a systematic way. No sooner is the phosphate rock loosened than it is removed from the scene of mining and tossed into railway trucks running and around the pinnacles of the worked out areas. Gangs of men attend to trains of trucks as the stuff is loaded, and these are pushed on to distributing hoppers, great wooden towers which stand out prominently, dominating the fields. From the hoppers it is by a very expeditious patent of trap-doors dropped on to trucks, which come up and are pushed away and filled with remarkable celerity ; these trucks are then sent from the hills down steep declines on the plan of loaded trucks descending as empty trucks ascend. Once on the main lines, at the junction of the declines, small but important looking, puffing railway engines make fast to long trains of the



The Loading Wharf at Nauru Island



Loading the Dump Cars with Phosphate Rock



The Natives of Nauru Island are a Handsome Race. Every Man and Boy Owns a Bicycle and are Expert Riders. The Nauruans are Famous for their Politeness, a Native Cyclist will Never Pass a White Person while on a Bicycle, but will get off and Walk Past and Bow Ringing the Bikebell all the Time

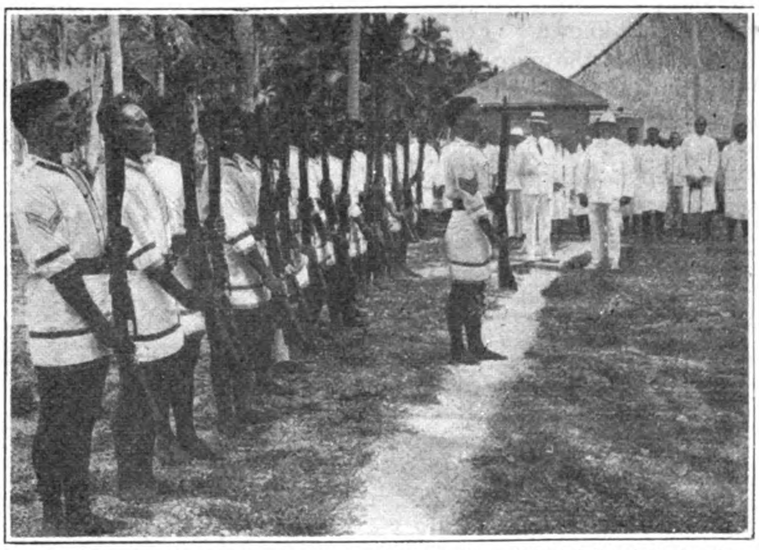
loaded trucks, which have been shunted into place by a number of natives; and these trains are then backed into the great buildings where the dryers and crushers are at work. The phosphate rock is dumped into wet hoppers, and passed from them to the great crushers, where it is broken up into a size suitable for drying and shipping. From the crushers the phosphate passes into the dryers, revolving cylinders in which the phosphate comes in contact with hot air. All moisture is thus evaporated. After leaving the dryers, the phosphate is taken by elevators and conveyers and distributed to the storage bins, capable on both islands of holding many thousands of tons. Another expeditious and useful patent is attached to these bins in long rows of trap-doors or opening valves, which fill up trucks by the mere pulling of a lever. The trucks are then shunted on to the jetties, and the phosphate passed through the jetty shoots into the surf boats below, as told before, and thence on to the steamers. To prevent stoppage of work in wet weather great areas roofed with galvanized iron are set apart, and here the workers can blast, dig and truck without discomfort of any kind.

The industries stand unparalleled in the tropic world, for the care, attention to, and comfort of the employees. A complete and successful domestic management ensures modern conveniences and comfort to the workers, irrespective of status or color and

Dancing Women of Nauru Island. Adorned for the Fish Dance

free of all charges. The health and entertainment of all are assured by well-planned system of sewerages, fresh and salt water in unstinted abundance, electric light, fresh food supplies, refrigerators and telephones connecting every office, work-shop and house. Every nook and corner of the settlements is lit up at night, giving the impression, when viewed from a few miles out at sea, of an approach to great towns. There is a free daily distribution of ice, with weekly distrbutions of useful household comforts, such as soap, cordials, etc., privileges perhaps unequalled in any industry in the British empire. The employees—white, yellow and black have free houses, free messes, free public laundries. Married men are allowed free houses and extra allowance for living. There are excellent free recreation and reading rooms, sports and tennis grounds, the company supplying reading matter and the implements for recreation and sport in billiard tables, tennis and cricket balls. There are free hospitals replete with operating rooms, dispensaries, furniture and conducted so well as to be without compare in the Pacific Islands. There are American doctors, one on each island, Australian matrons, and native orderlies, medical attention and medicines being free. There is a fish market and the natives of the islands are encouraged to bring in big supplies of fish daily, to be passed on to the various messes, the married people generally employing their own individual fisherman, who for 10s. a month provided any quantity. Asiatic and native laborers are well housed, fed paid, guarded in health, and worked under comfortable conditions, and wise methods as to time and weather.

The Chinese of Nauru have their tea houses and places of amusement, and though they come under a limited time of engagement since the war, they are so contented that each one signs on



The Native Police Force of Nauru Island; a Well-drilled Body of Men, very Useful and Intelligent

repeatedly for a further period of employment. The native workers have commodious dormitories and messes if single. The married men live in electric-lit, tiled-roofed, well finished, cool homes, and they have their dancing grounds for any festivity or rendezvous. On both islands are elegant, and complete stages for open-air entertainments, where high-class concerts and theatrical performances frequently take place to the benefit of patriotic funds, which have received some thousands of pounds. Although within touch of the equator, these islands are remarkably cool and salubrious in climate. The health of the communities has never suffered any epidemics and is maintained by a rigidly strict supervision of water wells, drains and all sanitation. Gardens and pretty hedges beautify the homes, the walks and the streets of the settlments. There is an air of comfort and cleanliness that is delightful, making the settlements ideal.

Three hundred thousand tons of phosphate-rock is exported every year from the islands. This goes to industries in various parts of the world when the rock is broken and graded up by sulphur and sand. Its action in plants as super-phosphate is almost magic.

French Railway Enterprise in Indo-China

M. Sarraut's Scheme

ONE of the most important steps for the development of Indo-China and Far Eastern communications generally, was announced at the last general meeting of the Compagnie Générale de l'Extreme Orient in Paris. This company is a combine of the strongest French industrial concerns for the advancement of French trade and engineering interests in this part of the world, comprising amongst its shareholders such prominent firms as the Cie de Fives Lille, French Thomson-Houston, Comptoir d'Exportation des Produits Metallurgiques, Société des Aciers de France, Hauts Fourneaux et Fondiers de Pont-a-Mousson, Société des Manufactures des Glaces et Produits Chimiques de Sant Gobain, Chauny et Cirey, Société Française d'Entreprises Industrielles et Commerciales en Chine, Société Industrielle des Telephones, Société Miniere et Metallurgique de Penaroya, Société de Constructions des Batignolles, Rocca, Tassy et de Roux, Delaunay-Belleville, Banque de l'Indo-Chine, with various other well-known French capitalists. As the outcome of an understanding with the governor-general of Indo-China, the component members of the Cie Generale d'Extreme Orient have organized under the direction of the Banque de l'Indo-Chine, the "Syndicat d'Etudes des Chemins de Fer du Sud de l'Indo-Chine" for the purpose of surveying and investigating the lines projected for the south of Indo-China by the governor-general of the colony, generally referred to as M. Sarraut's scheme. This commission has already established offices in Paris and is sending out a large surveying party to make the necessary reports.

The French have realized for many years that their colony is the link in an all through rail communication between Europe and Siam, and Singapore, shortening the distance to the East Indies and Australasia, and have directed their diplomacy towards facilitating the construction of lines that would make this feasible. The disorganization of China has prevented further progress in this direction by the construction of lines in this country until the consortium is accepted by the Chinese and the few remaining links in the through system are contracted for. With the completion of the Canton-Hankow line, there will remain only the comparatively short link between Canton, Nanning and Langson to complete the system, or, the same result would be obtained by the completion of the Siems-Cary line from Chuchow in Hunan to Yamchow in Kwangsi, which will pass through Nanning where the short connection with Langson is a comparatively minor matter. The French have been spurred into action by the extension of the Siamese southern lines to connect with the Federated Malay States system, thus making possible a great reduction in time between Europe and Bangkok. The Siamese government has also projected a line running east from the capital to the Cambodian border, where a connection with the Indo-China railways will still further shorten the distance between Saigon, Haiphong, Hanoi and Europe via Suez, and, when conditions are again normal over the trans-Siberian line, and connecting links are built in China, London and Paris would be brought within seventeen days or less with Singapore. The way things are moving, with Siam pushing her system steadily ahead and the French concentrating on their part of this general scheme, the last to swing into line will be China.

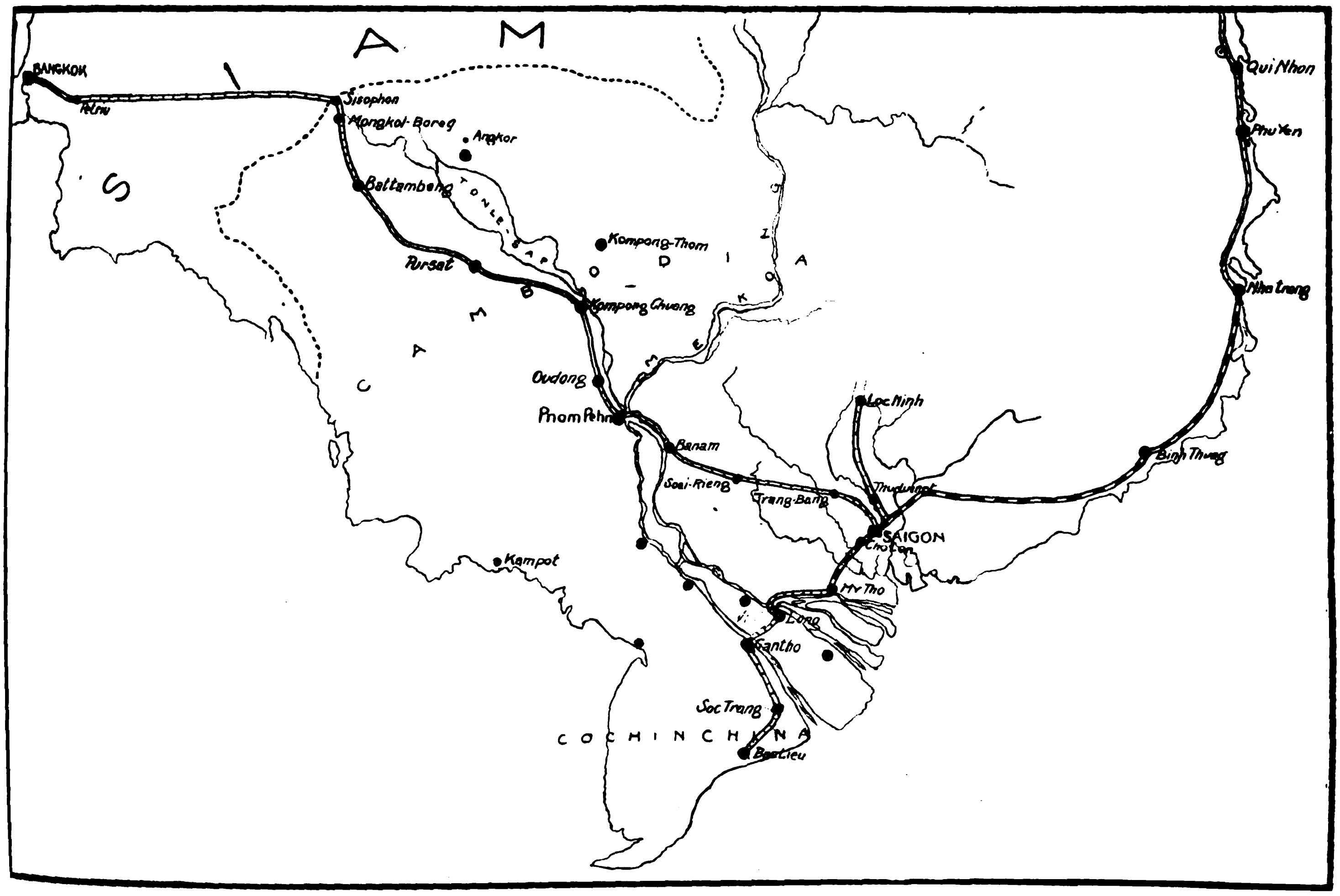
M. Albert Sarraut, Former Governor-General of Indo-China

The French end of this great scheme is simple, calling for the construction of a coast line from Nhatrang to Tourane, a distance of 530 kilometres, and another link from Saigon westwards through Phnom-Penh to Battambang and the Siamese border, a distance of 645 kilometres, or, a total of some 1,175 kilometres of new lines to link Singapore with Langson, on the Chinese border.

Probably the most important and urgent from the French view point is the southern line extending west from Saigon to the Siamese border and the extension from that point to Bangkok or the terminus of the Siamese lines at Petriu. This is the principal line in the scheme advocated by Governor-General Sarraut, and is to start from Saigon, the capital of Cochin-China, and pass through Pnom-Penh, capital of Cambodia, and thence through sparsely populated districts to Battambang and the Siamese frontier and on to Bangkok or Petriu. The section in Siamese territory, however, will only be taken in hand after the proper authority has been obtained through negotiations with the Siamese government. Through Bangkok, this line, as pointed out above, will have connections with the existing railways in the Federated Malay States, and with India, when the proposed section between Moulmein and Chengmai is completed by the Indian and Siamese authorities. This line, therefore, will not only facilitate intercourse between Indo-China, Siam, Federated Malay States and India, but open up to development the southern lake district of Tonle-Sap.

The first section of this line west from Saigon will follow the valley of the Mekong through Trang Bang, Soairieng and Banam to Pnom-Penh, crossing on its way the Great Vaico, the Small Vaico, the Kompong Trabor, the Banam and the Mekong Rivers, the width of this last being 1,200 metres with a depth of 15 metres. The second section proceeds up the Tonle-Sap valley following the river about 10 kilometres distant, instead of adhering to the old project around the north end of the lakes connecting Kompong Thom and Angkor. As the road from Pnom-Penh to Kompong Thom will be finished this year, and then extended to Angkor, it seemed preferable under the circumstances to follow the southern route which is 50 kilometres shorter and has the added advantage of connecting the important centres of Kompong-Loung, Oudong, Kompong Chuang, Battambang, Mong-Kol-Borey and Sisophon. The third section of the line passes through the valley of the Great Lakes at a slight elevation above flood level and thence up the Stung valley to the Siamese frontier.

admirable system of navigable waterways serving this district, and the high cost of building the long bridges over the various branches of the Mekong. The sudden development however of Western Cochin-China resulting from the deepening of canals for the past twenty years, has necessitated regular and economical rapid transport system in order to facilitate passenger and goods traffic between the high and low lands. In locating this line it has been difficult to connect the larger centres in a manner that harmonized with the possible sites for the more important bridge and embankment works. Three gigantic bridges would have to be constructed, one over the Mekong, 1,400 metres, over the Song-Cochien, 600 metres and another over the Bassic of 1,400 metres, in addition to 1,600 metres of secondary bridges. The Mekong Bridge alone presents a formidable engineering problem requiring pier foundations 40 metres deep. To increase the cost, the existing line between Saigon and Mytho will have to be brought up to standard working condition.



Map Showing the Projected Southern Indo-China Railways in M. Sarraut's Scheme

The greatest difficulty in the construction of this line arises from the low elevation of the country inundated at frequent intervals by the rise in the many rivers and requiring high embankments for at least three quarters of the entire distance. Furthermore, these conditions necessitate a large number of bridges, the longest being one over the Mekong, 1,200 metres ; the Bassac, 280 metres and the Great Vaico, 140 metres. This bridge work will greatly increase the cost of construction, that otherwise, would be comparatively cheap.

Another important line advocated by M. Sarraut for the south of Cochin-China will run across the delta from the terminus of the existing Saigon-Mytho line. For many years the business element of Saigon has been demanding the extension of the Saigon-Mytho line (69 kilometres) to Baclieu passing through the important centres of Vinh-Long, Cantho, Cairang and Soctrang. The execution of this work has always been defeated because of the

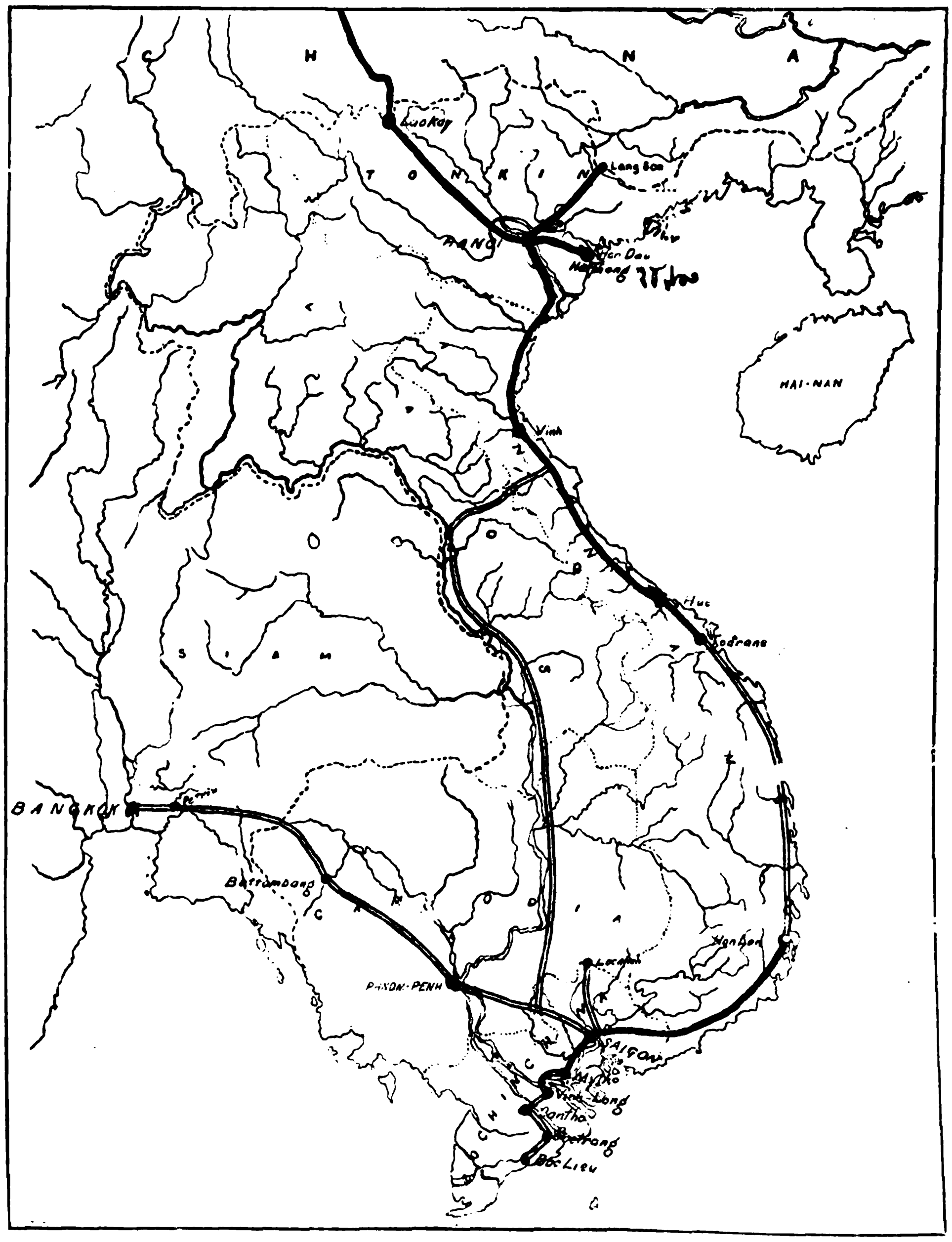
Another of the lines in M. Sarraut's scheme is one from Saigon to Locninh a distance of 125 kilometres, to tap the red lands of the Thudaumot province and contribute to developing the cultivation of rubber in that district. From this line, two others will branch off, one traversing Cambodia towards the Mekong to open up the Southern Laos, the other striking north towards Tourane through the South Annam table-lands. The Locninh line will connect with the existing Saigon Nhatrang line at Binh-Trieu station and proceed up the Saigon River district through Laithien to Thudaumot, and from here strike through the hills between the Saigon river and the Song Be passing through Xa-Trach, Hongquan to Locninh. This line is therefore one for the development of agriculture in Northern Cochin-China and Eastern Cambodia and will solve the problem of bringing labor to the districts and facilitate the opening of new lands.

In addition to these schemes for the development of South Indo-China which the engineers of the new French company are

now studying, there remains the larger and more important plan to connect the north and south of the colony by a direct line through the interior following the valley of the Mekong. The coast line which will eventually link up the two extremes of the colony now terminates at Tourane, half way down the coast. Between Tourane and Quinhon (300 kilometres) the line will traverse a cultivated and inhabited flat country cut by small hills of the Annamite chain. It presents no great engineering difficulties but necessitates a great number of bridges and fairly high embankments in the low lands of the deltas of the streams and rivers coming from the coast range. Between Quinhon and Nhatrang (230 kilometres) this line will open up Ninh-Hoa and the Tuyhoa district where an irrigation system of 17,000 hectares is to be developed but will have to pass through Mount Varella by a 1,200-metre tunnel and find its location for some distance along the abrupt slope of the granite bluffs that emerge abruptly from the sea. The minor Varella hills will require considerable cuttings, one 500 metres long, before the line reaches Nhatrang, while the Song-Darang calls for three bridges, one 150 metres long on the smaller branch, another of 600 metres for the main channel and a third of 150 metres for the Song-Bang Trach.

The difficulties of construction raised by the tunnelling of Mount Varella, taken in connection with the undeveloped condition of the districts traversed by this coast line, diverted investigation towards finding a more economical location for joining North and South Indo-China through the Annamite chain and the South Annam table-land into the valley of the Mekong and then down the incline to Saigon, opening up the rich forest lands of the interior and the famous red lands of Cambodia and Cochin-China. Politically, such a line had much to commend itself to the authorities as it facilitated extension of control over the Mois people who are still semi-independent.

It has been urged that the Tourane-Nhatrang section of the coast line is not vitally essential, as the ports are well served by an admirable coasting service, and the motor roads now under construction will meet for a long time the needs of travelers. Naturally, the idea of suspending construction on the through coast line, in favor of the interior line, has opened up considerable discussion in Indo-China, and when the advantages of the latter are viewed from the political and strategical standpoint, it is easy to understand that it meets with the endorsement of the governor-general. Under existing conditions, the coast lines, exposed to the sea or within easy reach of a hostile landing party, constitute a military weakness. The interior line is, therefore, of the highest strategical importance for the proper defense of the colony. It is also urged in favor of this route that when the Saigon-Pnom-Penh section of the line to Siam is constructed, it will pass through Payninh, where it would join the the Mekong line, thus shortening the total distance to a point where the Mekong line would not exceed in length the uncompleted sections of the coast line. No headway will be made in the construction of these two lines until a final decision is arrived at as to whether to continue the construction of the exposed coast line or proceed with the central line which will cut across the coast range the Meu-Gia ridge and come out into the Mekong valley near Thakhek and follow down the Mekong to connect with the projected Saigon-Siam line.



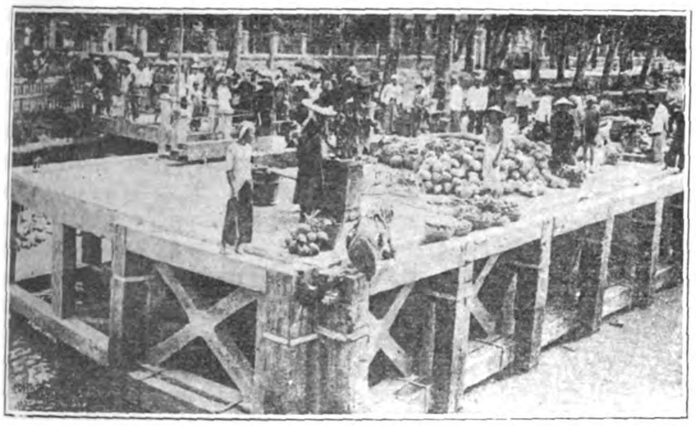
Railway Map of Indo-China Showing the Projected Mekong Valley Line

These questions are being freely discussed in Indo-Chine and we find Mr. H. Cucherousset, the able editor of "*L'Eveil Economique*," strongly advocating the Mekong valley route and fortifying his arguments with maps and plans which carry conviction. While this important link in Far Eastern communications may hang fire for several years yet, there seems to be excellent prospects of the southern lines in the governor-general's scheme being realized. Here, the determining factor is the excessive costs of enormous bridge work, offset to some extent by the extremely low cost of labor for general construction. Past experiences have taught the French railway engineers to be cautious in their estimates for construction in the interior districts, especially in the deep valleys of the Mekong and other rivers that flow down from the Himalayas. The construction costs of the Yunnan Railway jumped to almost prohibitive prices because of the great mortality of the laborers, who sickened and died like flies from the miasma that came from the rivers and the breaking of new ground. For instance, the Haiphong-Yunnan line with a total length of 853 kilometres (386 km. in Tonkin and 467 in Yunnan) cost 237,047,000 francs, of which 71,580,000 francs is charged against the Tonkin section and 165,466,000 to the Yunnan section, or about 185,000 francs per kilometre in Tonkin and 354,000 francs per kilometre in Yunnan, approximately twice as much as

Rail Depot along the Line of the Coast Railway in Indo-China

the section in Tonkin. In the colony proper, the most expensive line was the one from Hanoi to Namquan (167 km.) which cost to construct 41,034,000 francs, or 245,000 francs per kilometre. The line from Hanoi down the coast to Vinh (Benthuy) 326 kilometres cost 134,000 francs per kilometre.

Reverting to the Mekong Valley route advocated by Mr. Henri Cucherousset, he argues that the north Annam port of Vinh or Benthuy will become the logical terminus of the through China-



The Landing Stage at Vinh-Long

Government House at Cantho

Bangkok-Straits line by reason of the shorter time consumed in direct steamship navigation between this port and Hongkong or Canton over railway journey around the gulf of Tonkin.

"Benthuy," he says, "is 300 km. south of Haiphong and north of the great bulge formed by the coast of Annam, is situated on the river Ca, near the important town of Vinh. It can only give access to ships under 1,500 tons drawing no more than 12 feet. Although it taps two provinces with a population of 1,500,000 inhabitants and has large industries, especially the meat freezing and packing firm of P. A. Lapicque & Co., the building of which has cost 800,000 dollars, it is not proposed to do more than make the access a little easier to 1,000 tons steamers especially constructed for a regular fast passenger service with Hongkong. For the rest the present sea launches and lighters towed to the Bay d'Along or Haiphong will suffice. Benthuy is connected by rail with Hanoi and Haiphong but direct steamship line from Hongkong would save 14 hours railway journey whilst the sea journey would only be five or six hours longer than from Hongkong to Haiphong.

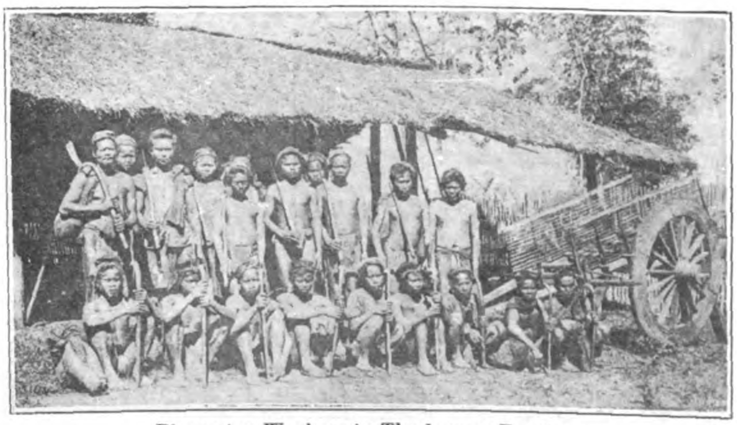
"Therefore Benthuy must be for Hongkong and Canton the head of the line to Bangkok. The distance from Benthuy to Bangkok would be about 1,000 kilometres ; from Hanoi 1,325 ; and from Haiphong 1,427.

"The railway is under construction south of Benthuy and will join the existing railway of Tourane to Hue and Dongha. It follows the coast and will be eventually continued down south until it meets the 410 km. long railway from Saigon.

"On leaving Vinh-Benthuy the proposed Mekong Valley line railway follows the rich and beautiful valley of the Ngan Saù river ; from that valley it passes to another which comes from Laos and runs southwards to the sea near Dong Hoi. The upper part of that second valley makes a deep cut through the Annamite Range and leads to a pass, the Meu Gia pass, which is one of lowest in that enormous and prohibitive chain of mountains. Through that upper valley and the Meu Gia pass a railway detached at Tan Ap from the coast railway could be easily constructed.

"Now from the Meu Gia pass the route to be followed depended entirely on Siam's railway policy. If the old plan of a railway from Korat to Roi-ed, with two branches, one from Roi-ed to Nongkhay and the other from Roi-ed to Nakon Panom had been followed, it is evident that after leaving the Meu Gia pass the French railway would have reached the Mekong by the shortest way, at Thakhet, opposite Nakon Panom. The distance from Thakhet to Tan Ap would have been about 190 km. or 280 from Benthuy.

"But Siam has decided to continue the Khorat railway toward Oubone, which is 300 km. south of Lakon Panom. It is, therefore, Oubone that the French railway must reach after passing the Annamite range. This is much more to the advantage of the French colony than the other solution as a line joining Meu Gia to Oubone would cross the Mekong at the Keng Yapeut, south of Kemmarat, thus keeping longer on French territory through the rich province of Savannakhet. The choice of Yapeut instead of Kemmarat for crossing the Mekong is caused by the necessity to meet a navigable stretch of the river. Savannakhet would be too far north and too much west of of the direct line. South of Yapeut, that is to say of the notorious Kemmarat rapids, there is a long stretch of navigable water extending for the whole length of the Bassac province, a province which already exports a large quantity of rice, thus giving the lie to the legend that the Lao people will only cultivate what is strictly necessary for their food. In times like the present, when precisely at the low water season there is a



Plantation Workers in Thudaumot Province

Mois on their Way to the Coast to Barter

Coolies Repairing a Dyke

dearth of rice in Siam, the exportation of Bassac rice, practically impossible by the Mekong, would then be diverted to Siam.

"The total length of the proposed railway, from Oubone, the terminus of the railway now under construction by Siam, to Tan Ap where the line would branch from the French coastal railway would be about 460 km. of which 370 would be on French and 90 on Siamese territory.

"The only difficulties would be on the first eighty kilometres on the French side where a lot of tunnelling and small bridges would be necessary; and then bridging of the large rivers Se Ban Bangfai, Mekong and Se Mool. The difficulties near the Meu Gia pass, however, would be nothing compared with those the French engineers so successfully overcame in Yunnan, and the bridging of the Sebangfai and Se Mool would be made in the dry season when the greater part of the work would be in dry ground. As for the Mekong it is the easiest river in the world to bridge, as at very frequent intervals there are across the bed of the river gigantic barrages of enormous rocks which appear at the low water season leaving only a number of narrow channels. So no foundations would have to be made under the water or in bad ground; it would only be a question of how many tons of steel. Would the railway be a paying proposition?"

"There can be no doubt about it. Not only would it help to develop very rich districts where rice, tobacco and cotton can be cultivated and cattle bred in large numbers with beautiful forests of easy access from the proposed railway and several copper and tin mines, but it would bring to the port of Benthuy and secure for Bangkok a large part of the Mekong trade. That can now, with very poor communications and a population which has nothing to incite it to work, he estimated at 80,000 tons. It would soon be trebled as the Lao population would be encouraged by the new facilities to dispose of their products and receive at reasonable price manufactured goods, and as there would be soon a great movement of immigration from Tonkin. The Tonkinese who are overcrowded in their delta, are active and willingly emigrate when easy communications leave them the possibility of going back home at any time. Already they come in large numbers along the Mekong in spite of enormous difficulties and the Annamite population of Vientiane for instance passed from 1,200 to 6,000 between 1914 and 1920.

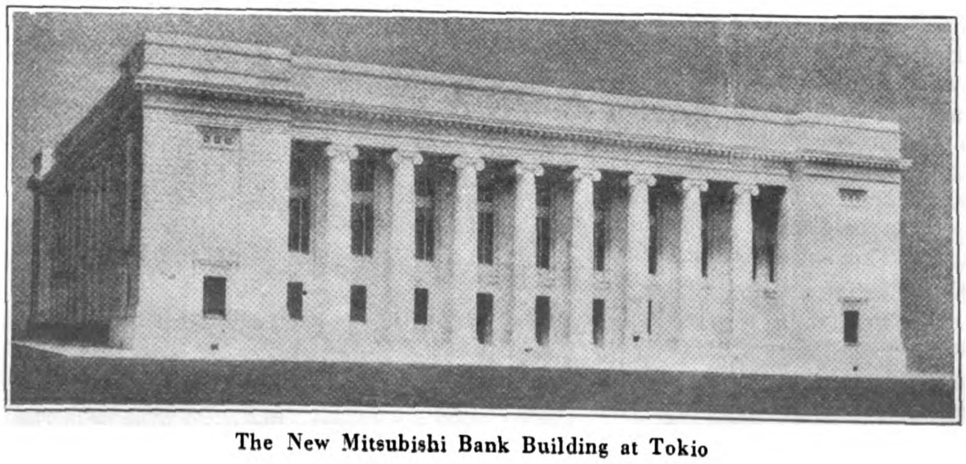
"The railway would also be used by the Tonkinese emigrating to Cambodia and North Cochin-China where already thousands are employed on the rubber plantations.

"Then as an international railway the proposed line would be of immense value. Bangkok would cease to be an out-of-the-way place to become the centre of a new system of communications and many of the travelers from Hongkong to Siam would close that way.

"I consider that this is one of the finest propositions that can be laid before the capitalists of the Far East, and that it should not be difficult to raise the necessary capital on the spot, that is to say between Bangkok, Singapore, Saigon, Haiphong and Hongkong. The cost would probably average 50,000 ticals a kilometre or about 20,000,000 ticals as it is probable that the Siamese state railways will build their part of the line up to the Mekong on the resources of the Siamese budget."

The New Mitsubishi Bank Building

ONE of the handsomest buildings this side of Suez, designed by Dr. Kotaro Sakurai the noted Japanese architect, has just been completed for the home of the Mitsubishi Bank opposite the Municipal Hall in Tokio. It is pure Grecian Ionic in outline similar to the United States Treasury, with a row of eight massive stone columns on the facade. The dimensions of the building are about 200 by 180 feet. The framework is of steel imported from the United States. The feature of the main floor, the huge banking room, will be 70 feet wide by 140 feet long and 45 feet high, finished in terracotta imported from America, with floors of Italian marble. Massive bronze doors, bronze railings and counter screens were also imported from America. The vaults and doors came from England. The building is equipped with three elevators. The construction of the building which was carried out under the supervision of the architect by the Mitsubishi estate department has cost about Y.3,000,000.



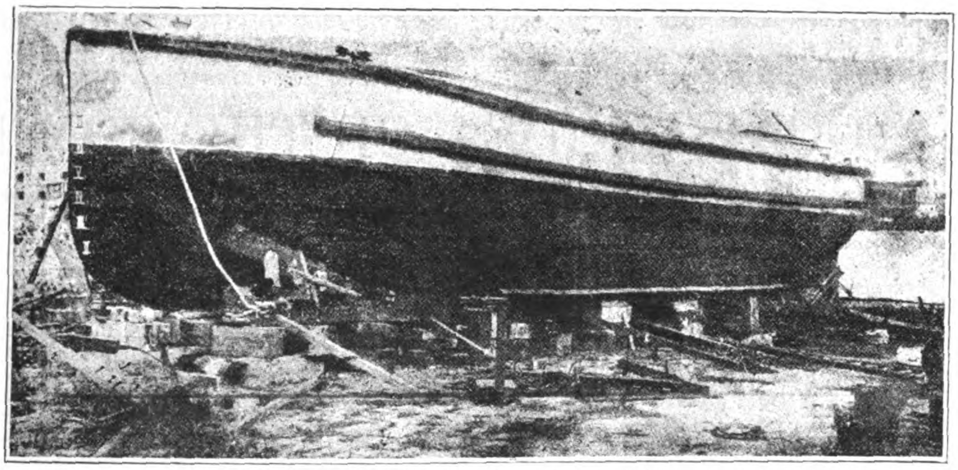
The New Mitsubishi Bank Building at Tokio

Reinforced Concrete Ships in the Orient

WITHIN the last few years, not only river barges, but cargo-boats of several thousand tons burden, have been successfully built of reinforced concrete, and have proved by their general seaworthiness, their right to a place in the front rank side by side with steel or wooden vessels. Such ships are now being built regularly in England and the United States as well as in other countries where steel is even more expensive.

The war brought to the notice of those interested, the fact that reinforced concrete has the same qualities essential to shipbuilding as timber or steel, viz.—strength, water-tightness and—in spite of a widespread impression to the contrary—elasticity. To this latter quality any contractor who has handled long piles, or made tests on reinforced concrete floors or bridges will testify, when the test load is removed the deflection disappears, and the structure perfectly elastic, returns to its original form.

In 1915 it became necessary to replace the vessels sunk by German torpedoes, and rapid construction was essential. Steel was becoming scarce and expensive. Timber was first thought of and as stocks of seasoned timber were getting very low, American forests were felled and turned, all too quickly, into large vessels. The check received by this timber fleet is common knowledge. On second thought reinforced concrete was adopted with complete success. The constructional problems presented were successfully met, and experience has proved the ample constructional strength of ships built of this material.



Concrete Barge built at the Hongkong Works of Brossard-Mopin

Reinforced concrete vessels show two advantageous qualities; in addition to being good sea boats and behaving admirably in heavy weather, their vibration is much less than in steel boats, and the period of roll much longer. No leakages have been reported, but a few fine cracks in the shell and bulkheads of ships in service have been noticed. These cracks proved unimportant and have no effect on the structural strength of the ship. These vessels however require more adequate fendering than steel boats.

Experience shows that severe concentrated blows on the shell, such as would only indent the steel plates, tend to shatter the concrete around the point of impact. Adequate fenders would permit the absorption of such shocks by a resitient material and obviate this disadvantage. These remarks apply particularly to barges. It has been found, however, that repairs are relatively simple in such cases, and can be effected by any handy man with little loss of time and at a slight expense, which is more than compensated by the elimination of the heavy maintenance charges for a steel vessel occasioned by the continual fight with rust.

The rapidity of construction of reinforced concrete ships is practically independent of size, as the number of workmen employed at the same time is proportional to the volume of concrete in the structure, which volume is in turn proportional to the tonnage of the vessel. The time of construction for a yard with ordinary equipment varies from five to six months for the hull. The fitting out of a reinforced concrete vessel requires the same time as for a steel one. A comparison of a steel and a concrete vessel of the same deadweight carrying capacity reveals the fact that the concrete ship, on account of the greater weight of the hull, must have greater dimensions than the steel ship, and in consequence, greater hold spaces. For heavy cargoes, such as coal, ore, oil and steel billets, as the deadweight capacity will be reached in both cases before the holds are filled, the steel ship has an advantage over concrete as the material of construction, other factors being equal.—For light cargoes, on the contrary, the increased hold volume of the concrete vessel reverses the position—the steel vessel being filled before its full deadweight capacity is reached.

In the design of a steel ship straight lines are adopted as far as possible, whereas for the concrete vessel long, sweeping curves are desirable for economical construction. A concrete ship will hence have finer lines than an equivalent steel vessel, thus offsetting again, by a diminished resistance to propulsion, the increased operating charges caused by greater displacement. The employment of reinforced concrete has, in addition to its usual advantages, special interest in the Orient; the bulk of the labor required, as has been amply demonstrated in the construction of ships already launched, need not be especially skilled, and is thus easily obtained, the majority of the materials required are available on the spot and of excellent quality; rapid construction is easy where labor is plentiful and cheap.

In the Far East the Etablissement Brossard, Mopin, Contractors, the pioneers of reinforced concrete ships on this side of the world, have successfully launched several such; details of three typical examples are given below:

1. *Barges Launched Six Years Ago at Saigon.*—These barges were employed as pontoons carrying steam driven pile drivers without showing any trace of damage resulting from the severe shocks to which they were subjected, and are still employed for the transport of materials for public works, and as house-boats, sheltering the firm's agents in the vicinity of works in progress in the bush.

2. *Ferry-boat Built at Singapore* to carry wagons of the Federated Malay States railways across the narrows to Johore. This boat, ordered on account of the impossibility of obtaining the steel necessary to replace the existing ferries, was built to a similar specification in five months' time to the following dimensions: Length, 127-ft.; width, 27-ft.; moulded depth, 7-ft. 6-in. The load carried is approximately 150 tons, and for the last three years this ferry has made several trips a day carrying six goods wagons from the island to the continent without showing any sign of fatigue or damage, and remains perfectly water-tight.

3. *Cargo Boat—"Cochin-chine."*—Externally the hull has exactly the same lines as a steel or a timber hull, its curves having been determined in the same manner as such hulls. The following are the general dimensions of this ship: Length between perpendiculars, 269-ft.; moulded width, 38-ft.; moulded depth 24-ft. 6-in.; average loaded draught, 19-ft.; corresponding displacement, 4,500 tons; draught empty, 11-ft.; oil tanks (combustible) and fresh water, 240 tons; provisions and various supplies, 24 tons; cargo, 2,000 tons; volume of the four holds, 37,000 cu. ft.; horse-power, 1,000; number of screws, 2; speed, 10.4 knots.

Internally the hull is built on a special honeycomb system of great strength, combined with minimum weight. The main frames

are formed by joining up the bottom, side and deck beams. The construction on this system of such a vessel as the *Cochin-chine* demands of the workmen, skill, handiness and patience, such as are the special attributes of Far Eastern races, and it is for this reason that the constructors, experts in reinforced concrete work, having already successfully launched several barges and a ferry-boat, had no hesitation in undertaking a construction of such importance.

ENGINES—The twin screws are driven by two Diesel engines of 500 hp. each, having six cylinders, and turning at 187 R.P.M., built by Messrs. McIntosh & Seymour at Auburn (New York). These engines gave an officially recorded speed of 10.4 knots at the trials. Their consumption is 0.955-lb. of oil per horse-power hour, and as the tanks have a capacity of 240 tons of oil, the vessel can be navigated during 40 days without replenishing. As this vessel was built during the war, the shortage of materials forced the builders to utilize engines, and above all fittings such as could be obtained, and far in excess of the strength required for such a ship. For this reason certain figures given above are somewhat unusual; some 150 tons of carrying capacity being lost in this way.

The *Chinchine* which was built under the supervision of the bureau veitas, is classed by that corporation I. 3/3. G. 1. 1. and is insured under similar conditions to steel or wooden vessels. Since her trials, which took place in December 1919, she has maintained a regular service between Singapore, Saigon and Haiphong and in March 1920, transported two military contingents of 500 to 600 men, each from Saigon to Haiphong in addition to her cargo.

This vessel has proved altogether seaworthy, and on account of the large diameter of her screws, manœuvres very easily and can be brought to a standstill in her own length. The hull of the *Cochin-chine* described above contains 1,200 tons of concrete reinforced with 300 tons of steel. An equivalent steel ship would require some 1,300 tons of steel sections and plates. The difference in weight is not very considerable. On substracting the weight of steel bars in either case there remains 1,200 tons of concrete as against 1,000 tons of steel, which latter would obviously cost far more than 1,200 tons of concrete, in fact the concrete hull would cost at the time of writing some 50 to 60 per cent. less than the steel one.—A very remarkable difference.

The most interesting application of reinforced concrete in the Far East at the present time is undoubtedly to the construction of coasting steamers and boats for river traffic. The development of this trade provides a very interesting investment, especially in view of the present situation with regard to shipping. Overseas freightage rates are falling rapidly and many vessels are immobilized, whereas, on the contrary, a fact worthy of attention, coastal and river rates steadily maintain their high level.

THE CARTOONISTS' IDEA OF THE CONFERENCE

DISSOLVING THE PARTNERSHIP
By Rollin in the New York *World*

MAYBE THEY WILL STAY RIGHT THERE
By Walker in the New York *Call*

THAT'S NOT THE WAY TO REDUCE
The Philadelphia *North American*

"WATCH YOUR STEP"
By Window McCAY in *The American*

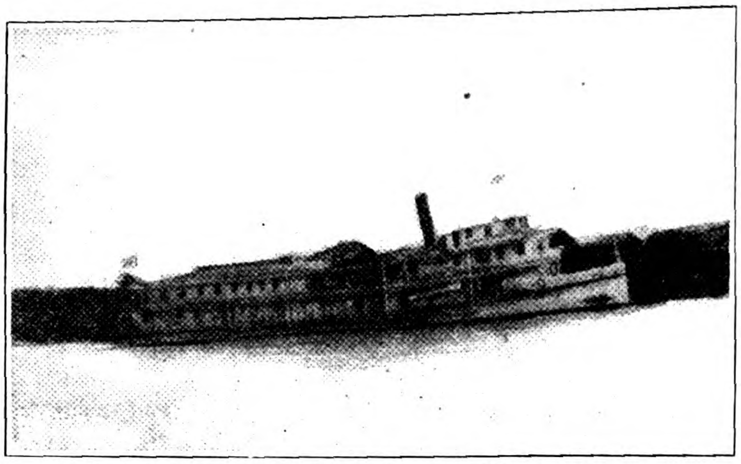
IN HIS OWN KITCHEN TOO!
By Rollin in the New York *World*

THE OPEN DOOR
By Marcus in the New York *Times*

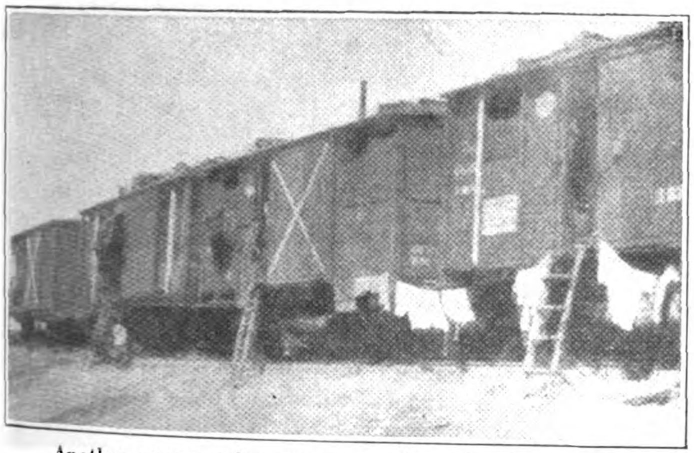
Re-birth of Industry and Commerce in Eastern Siberia

By Orrin Keith

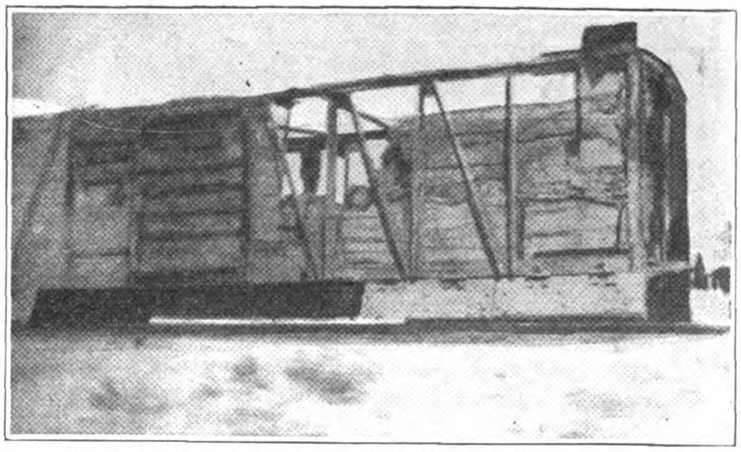
The central fact in the life of the citizens of the Far Eastern Republic is the railroad. Fortunately revolution and civil war, while they destroyed most of the bridges, left nearly all the stations intact. This is the station at Khilok.



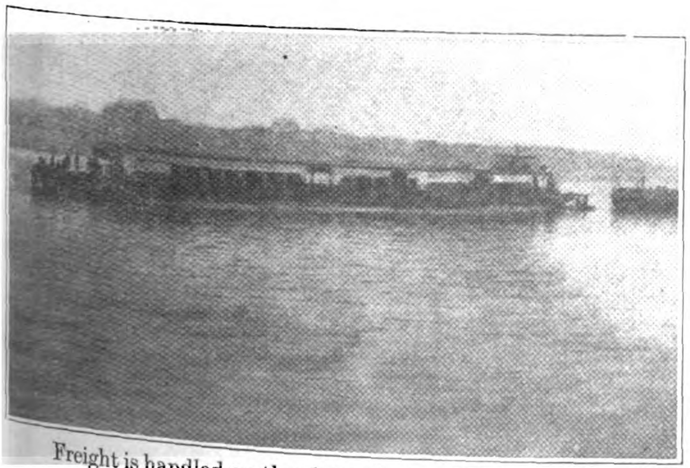
The burden on the railroad is relieved during the summer by steamers on the long navigable rivers of Siberia. Regular service connects the river ports from Stretensk to Nikolaievsk and from Blagoveschensk up the Sungari to Harbin.



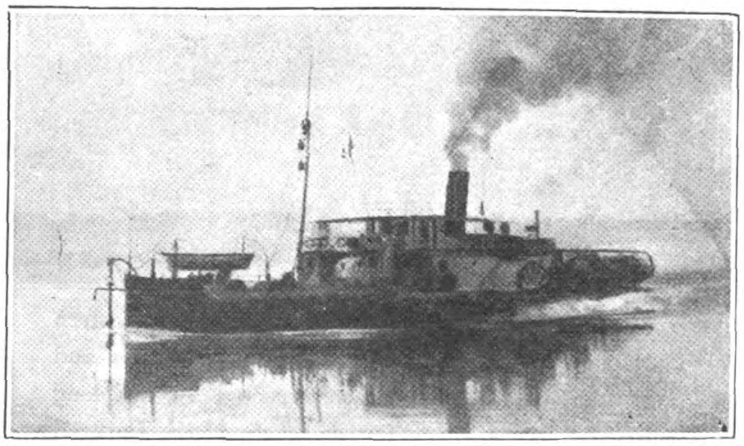
Another reason why cars are short is that many of them are standing on sidetracks and being used as houses. These are near Chita. There are many more at other places particularly at Grodekovo, where they have served as barracks for Kappelists and Semenov troops.



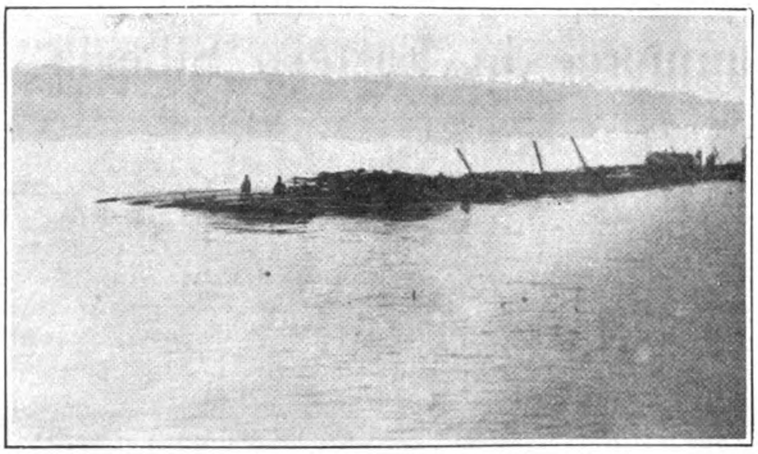
Destruction was not confined to bridges, but thousands of cars were wholly destroyed or rendered useless. This is an armored car of the Semenov troops. A six-inch wall of concrete was built inside the regular walls of the car. It was destroyed in an attack by the Siberians.



Freight is handled on the rivers in huge barges. Their great beam and shallow draft render them less liable to delay by grounding on the shifting sands of the river bottoms. A single barge can carry a tremendous load.

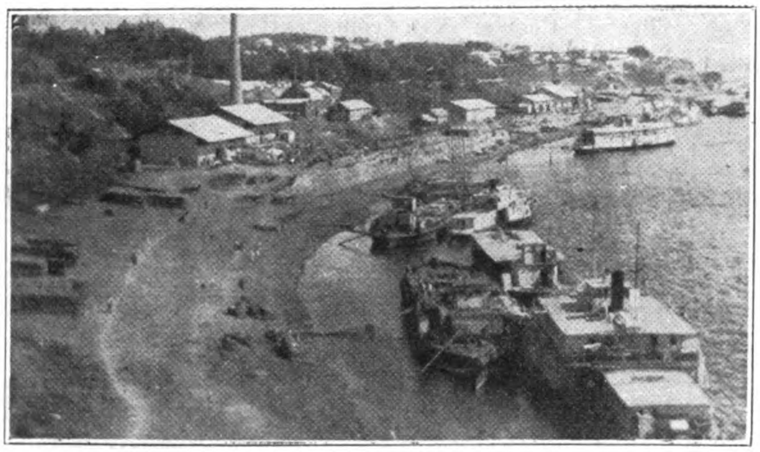


Barges are drawn, sometimes in strings of two or three, by powerful, side-wheel, shallow-draft tugboats. The fuel used is wood and, as the tugs are all engine, they consume a vast quantity in a day's work.



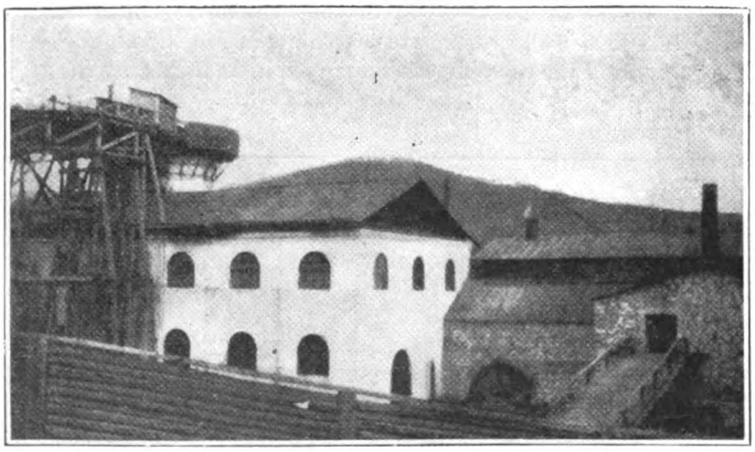
Another type of craft uses cheaper fuel. The huge timber rafts float down the stream, controlled only by the long sweeps which are set both fore and aft. Their crews are mixed Russian and Chinese and live in small huts on the rafts for weeks at a time. Some of them are even provided with horses or cows.

The city waterworks of Stretensk consists of a large number of these carts. They drive into the river, the barrel is refilled, and house to house delivery is made. Running water, in a Siberian city, means a steam pipe alongside of every water-pipe to keep it from freezing for seven months of the year.

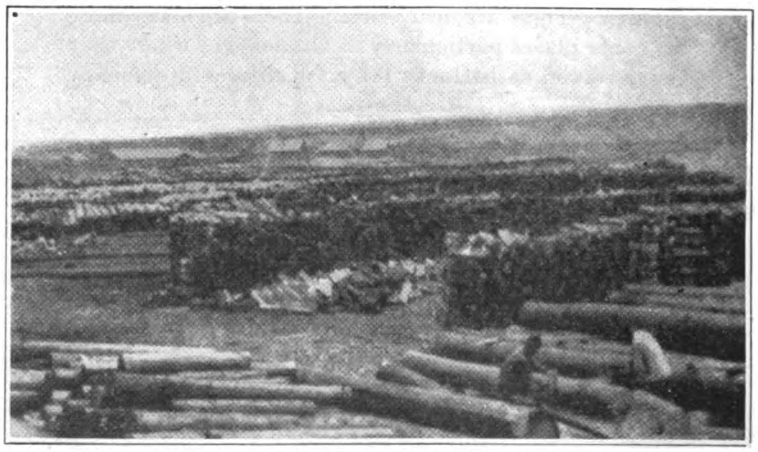


The big Russian passenger steamers tie up along the water-front at Habarovsk at the junction of the Amur and Ussuri rivers. Habarovsk is beautifully located on a high bluff overlooking the confluence of the two rivers.

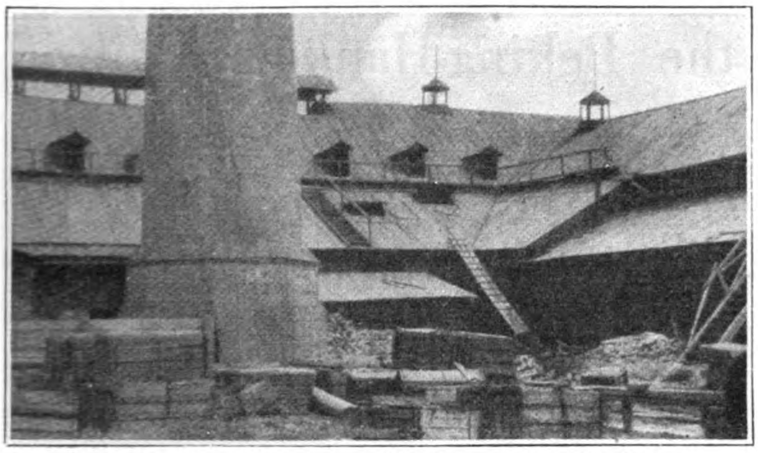
Another freight carrier frequently seen on the Amur River is the Chinese junk. Opposite every Russian settlement is a Chinese village and there is a constant exchange of products between them.



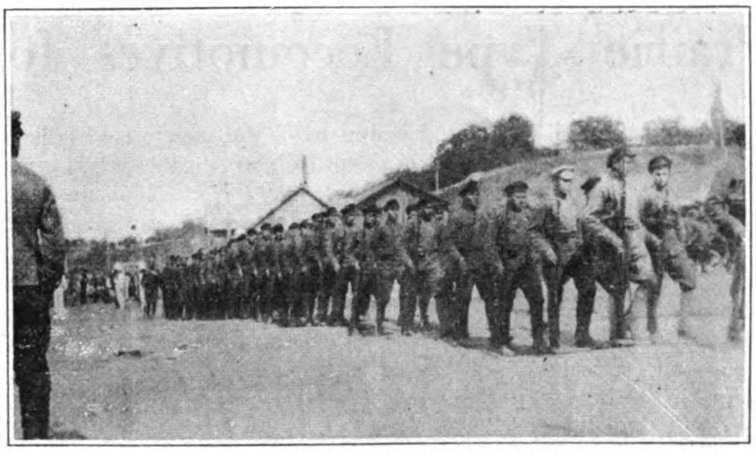
The most famous iron-works in the Far Eastern Republic is Petrovskoe-Zavod, between Chita and Verkhne-Udinsk. It was constructed by, and long worked by, prisoners, for the benefit of the Imperial purse. It was shut down during the war, but has been re-opened by the Trans-Baikal Co-operative Society, which is making many improvements.



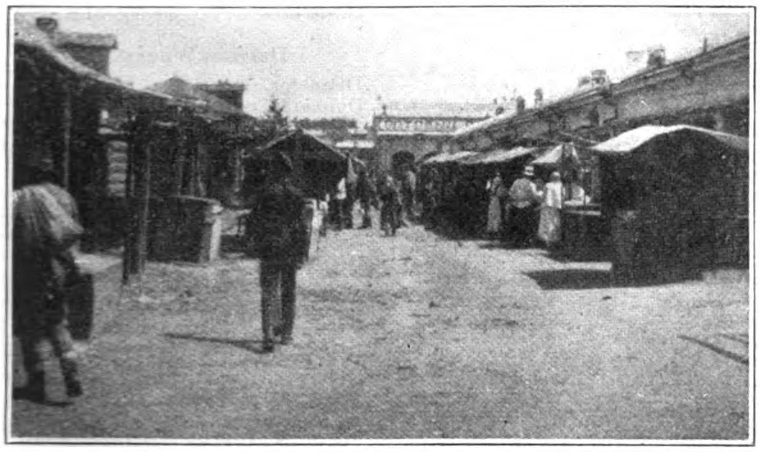
The greatest drawback to industry at Petrovskoe-Zavod as well as at other plants demanding a high fuel consumption is the lack of coal. There is not enough coal being produced now to fully meet the railroad requirements and other industries must use wood. The only smelting coal in the territory of the Republic is in the Maritime Province and is now in the hands of the Japanese. This is the woodpile of a Siberian factory. It covers 6 or 8 acres.



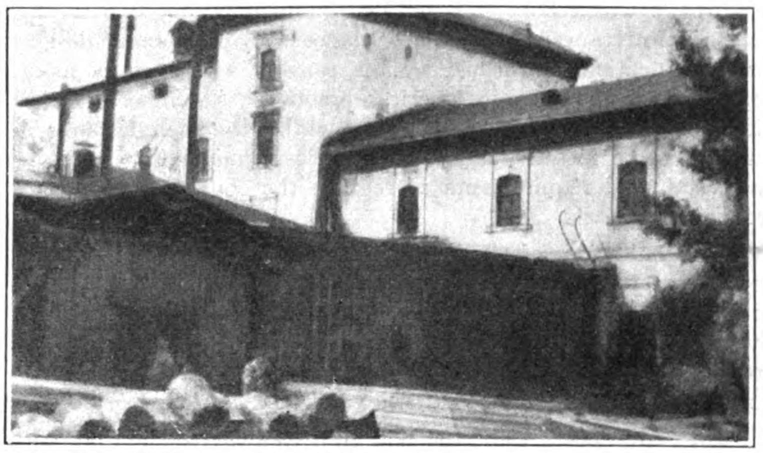
In spite of this handicap, the Co-operative Societies have renewed production in the glass works at Verkhne-Udinsk and the output is nearly as large as before the war. Window-glass, tableware, bottles and all sorts of containers are made here.



The necessity of keeping a large standing army under arms to defend the country against further raids by the bands of Ungern or Semenov has delayed the re-establishment of industry. This is a company of the Peoples' Army.



Trade, too, is making its re-beginnings on a small scale. There is no "Big Business" in eastern Siberia as yet. The peri-patetic Chinese merchant is the chief operator. He is bringing to the Siberians and selling in the bazaars, of which there is one in every city, the piece goods and small manufactured articles they so sorely need.



Necessarily the first shops to begin work after the civil war were the railway repair shops. The large shops at Chita and Habarovsk are now running and slowly repairing the destruction done to the roads. That is, when they are not turned aside to make armored trains or repair field-guns for the army.

CONFERENCE CARTOONS

THE COLOSSUS OF THE EAST MUST HAVE STANDING ROOM
By Knott, in the *News* (Dallas, Texas)

WHY NOT DISPOSE OF HIM NOW, BEFORE HE GROWS BIGGER?
By Perry, in the *Oregonian* (Portland, Ore.)

WILL HE CROWD "ARMAMENT" OFF THE BENCH?
By Henry, in the *News-Press* (St. Joseph, Mo.)

Prairie Type Locomotives for the Peking-Hankow Railway

DURING 1921, in keeping with the progressive policy of the Chinese government railways orders have been placed for more than 120 locomotives. This number is probably equal to, or more than, the number that had been purchased in any two previous years in China's history. Of this number the Kin Han Railway will receive 60 prairie type locomotives, 30 of which were ordered direct from The Baldwin Locomotive Works, the balance from the Societe Belge pour l'Exportation Industrielle through the Chinese banking group.

The prairie type of locomotive (2-6-2) was first evolved in the United States for use by the Chicago Burlington & Quincy railroad in 1900 and was used for hauling live-stock quickly across the great prairies in the western part of the country. It has a two-wheel front truck, six coupled driving wheels and a two-wheel trailing truck and is a natural development from the Mogul (2-6-0) type.

In 1919 the Kin Han Railway ordered 30 locomotives of this type, 10 of which were built by The Baldwin Locomotive Works. The locomotives were built in accordance with preliminary designs and specifications furnished by the railway with certain modifications which conform to American practice. A number of rather difficult problems were successfully met by the manufacturer in building these locomotives, including close limitations of weight and very rigid requirements as regards the counter-balancing of reciprocating parts.

The limitations of weight made it necessary to design all parts as light as possible, consistent with the desired strength and, to conform to the railway's specification, only about 46 per cent. of the reciprocating weights were balanced in the driving wheels, in order to keep the dynamic augment or increase in rail pressure, down to 15 per cent. of the static load at 60 kilometres per hour.

On March 30th, 1921, the Kin Han Railway ordered 30 more prairie type locomotives from the Baldwin Locomotive Works. The terms of the contract stipulated that 15 of the locomotives were to be delivered in China in 5½ months and the balance in 6½ months after the signing of the contract. These locomotives were completed and the entire 30 shipped from America on June 11th, 1921, arrived in China and were on the railway wharf near Hankow on September 4th, just five months and five days after the contract was signed, and on November 4th the entire 30 had been re-erected at the railway's shops at Kilometre 10, near Hankow.

A rather unique feature of these 30 locomotives is that they are equipped with copper firebox and combustion chamber. It is believed that these are the first locomotives so equipped, but we would be pleased to hear from our readers on this point if it appears to be incorrect.

Other features of the locomotives include American type bar frames, superheaters, Walschaerts valve gear, Westinghouse air brakes and steam heat Nathan simplex injectors, Nathan five-feed lubricators, Coale safety valves, 18-in. round case headlights fitted with Pyle national incandescent electric equipment, Janney M.C.B. automatic couplers and Haessler speed recorders.

The specifications for the locomotives which are being used equally well for passenger or freight service are as follows:

Gauge	4′ 8½″
Cylinders	20″ x 26″
Valves	Piston 10″ dia.

Boiler

Type	Conical
Diameter	60″
Thickness of barrel sheets...	9/16″ & 5/8″
Working pressure	170-lbs.
Fuel	Semi-Bitum. coal

Firebox

Material	Copper
Staying	Radial
Length	83⅞″
Width	54″
Depth, front	67½″
Depth, back...	54″

Water Space

Front	4″
Sides	3″
Back	3½″

Tubes

Diameter 5⅜″	2″
Material, Steel... ...	Steel
Thickness No. 9 W.G.	No. 12 W.G.
Number 21	130
Length 14′ 7½″... ...	14′ 7½″

Heating Surface

Firebox	127 sq. ft.
Combustion chamber	56 sq. ft.
Tubes	990 sq. ft.
Flues	430 sq. ft.
Fire brick tubes ...	15 sq. ft.
Total	1,618 sq. ft.
Superheater	371 sq. ft.
Grate area	31.5 sq. ft.

Driving Wheels

Diameter, outside ...	59″
Diameter, centre ...	53½″
Journals, main ...	8½″ x 11″
Journals, others ...	8½″ x 11″

Engine Truck Wheels

Diameter, front ...	33½″
Journals	6″ x 12″
Diameter, back ...	39⅜″
Journals	7″ x 12″

Wheel Base

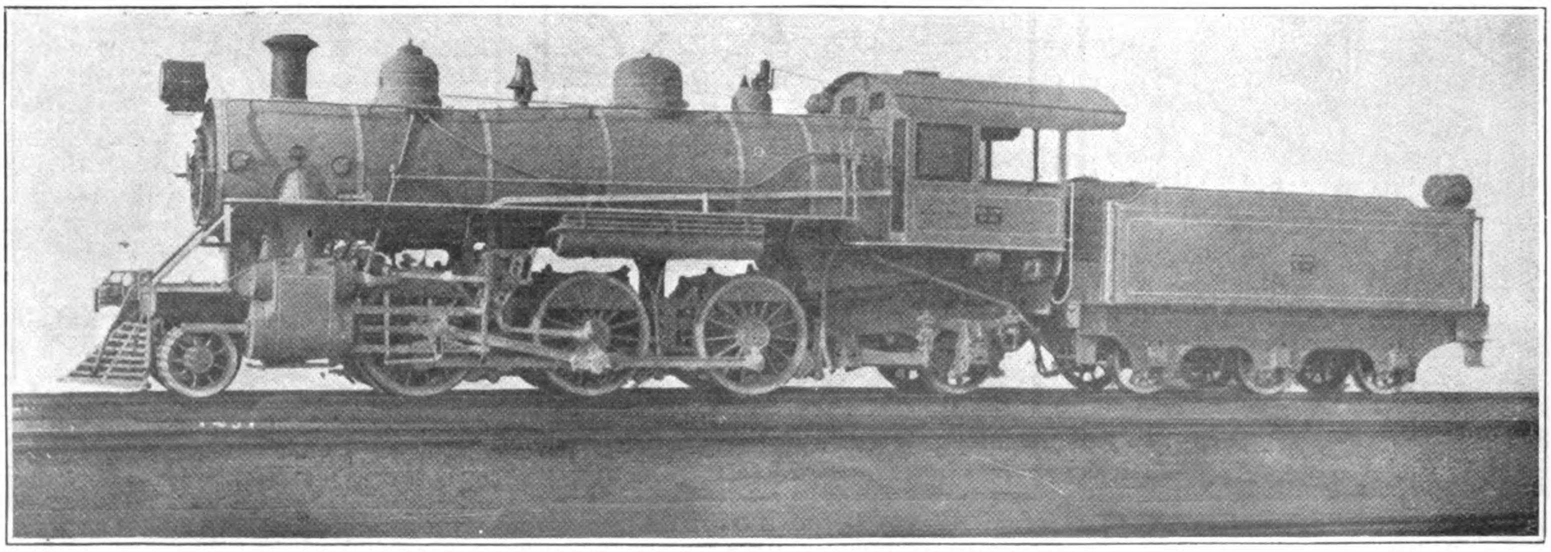
Driving	13′ 10″
Rigid	13′ 10″
Total engine	31′ 7″
Total engine and tender	53′ 10¼″

Weight

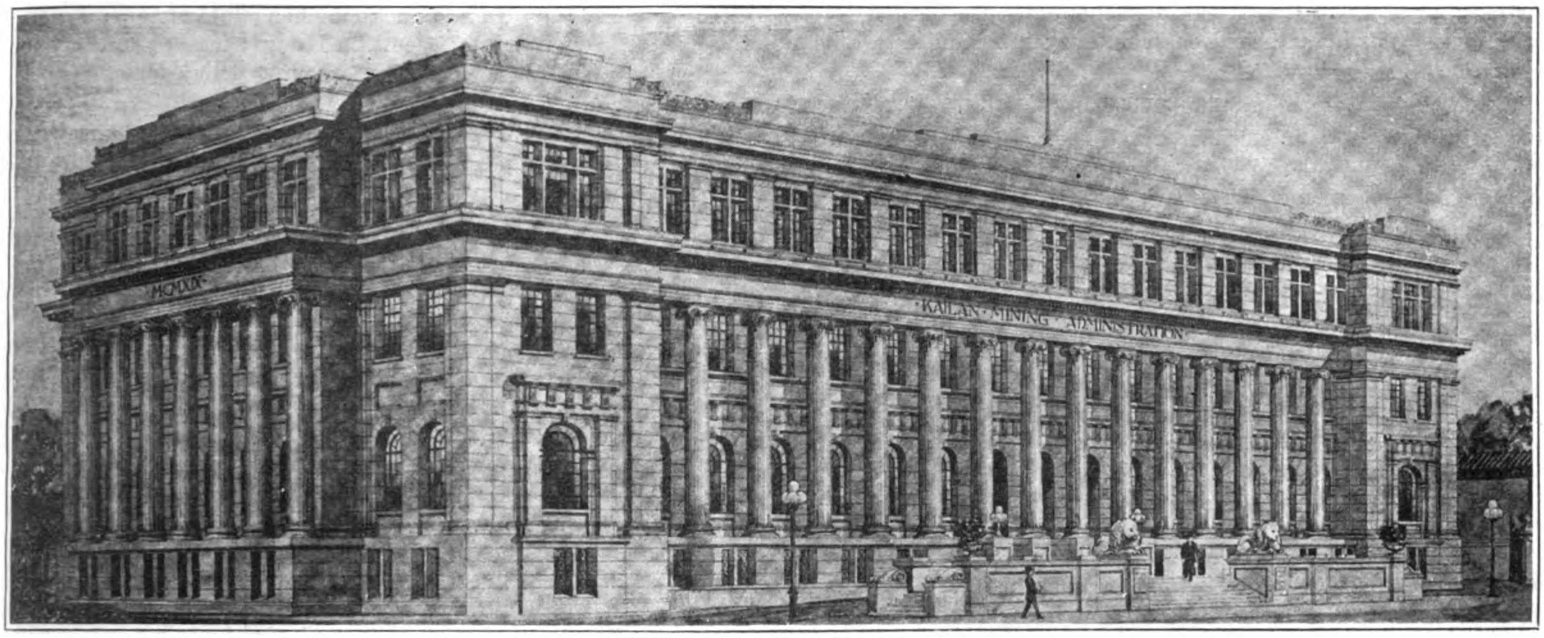
On driving wheels ...	99,000-lbs.
On truck, front ...	25,000 ,,
On truck, back ...	31,000 ,,
Total engine	155,000 ,,
Total engine and tender	247,500 ,,

Tender

Wheels, number	6″
Wheels, diameter	39⅜″
Journals	5.11″ x 10.23″
Tank capacity	4,800 U.S. gals.
Fuel	7 tons
Tractive force at 85% of working pressure	25,500-lbs.
Service ...	Passenger and Freight.



Latest Type of Baldwin Locomotives for the Peking-Hankow Railway



New Kailan Administration Building at Tientsin

The New Kailan Building

THE new headquarters of the Kailan Mining Administration at Tientsin now nearing completion, is one of the finest examples of foreign architecture in China. It was designed by Mr. B. C. G. Burnett, the Tientsin representative of the well-known firm of Atkinson & Dallas, Ltd., in competition with several other architects. The contract for the erection has been carried out by Mr. Hong Mow-kee, a prominent Chinese builder of Shanghai who has had special experience in the use of artificial stone such as is used for all the face work of the new structure.

The new offices form a rectangular pile 220 feet long and 120 feet deep with four stories aggregating some 70 feet in height, faced in artificial grey granite.

Mr. Burnett has adopted the Neo-classic style, and indicates Roman influence in the treatment of the main floor windows but, in the final plans, this has been eliminated by the adoption of square, mullioned openings, leaving the style throughout purly Grecian.

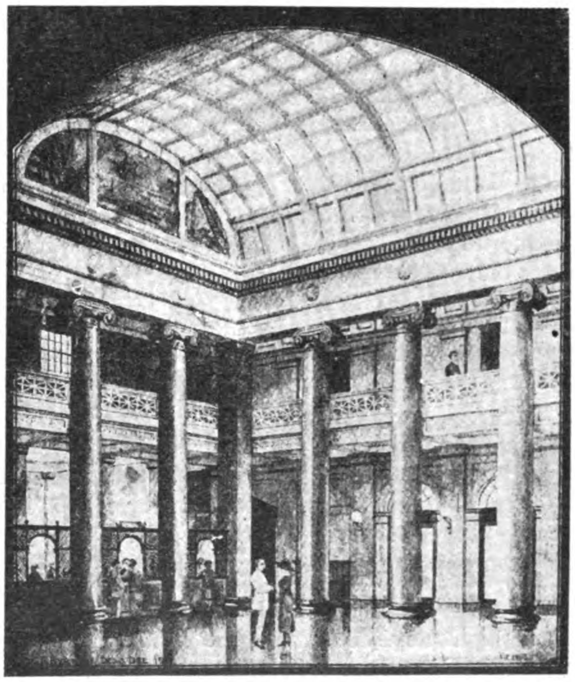
The main facades consist of colonnades Ionic columns on pedestals rising clear above the terrace, surmounted by an attic order. Boldly displayed on the main frieze is the administration's title and the year of construction in Roman numerals fashioned in bronze. The main entrance occupies the three central bays of the Meadows Road frontage and is approached by a broad easy flight of the steps in natural granite which lead to the vestibule through treble swing doors.

The Basement

The basement stands practically at the level of the adjacent public roadways and is waterproofed to a degree calculated to withstand any possible water pressure. It will provide accommodation for the British post-office, the entry for which is on the west front ; for a chemical laboratory ; the heating and hot water installations ; record rooms as well as foreign and native kitchens.

Main Floor

The most striking feature of the main floor is the large galleried court occupying the centre of the building, and giving access to the principal offices, the grand marble staircase, elevators, the public counters, etc. The lighting of this court is obtained through a semi-circular dome fitted with leaded lights in which pale amber color predominates, relieved here and there with patches of sky blue and red. At night, electric lamps will diffuse light above the stained glass while the floor of the court will be amply illuminated from bracket lamps forming the lighting scheme of the corridors and from clusters of opaque circular globes supported by four bronze standards.



Main Hall of the New Kailan Building

Rising from a Mosaic tiled floor, and supporting the central dome, are sixteen columns of polished Tsingtao granite in a rich shade of red. These columns are 28 feet in height and of a mean diameter of three feet. Additional color is lent to the interior decoration by paintings typical of the administration's activities, which will fill the panels of the vertical walls of the dome.

Massive panelling in stone finished plaster constitute the general treatment of the interior walls conforming, in a modified degree, to the classic style of the exterior.

The managerial suite of rooms, connected by the private corridor, occupy the whole of the eastern front and are fitted throughout with hard-wood parquetry flooring and massive oak panelling. Lamps concealed in the cornices will diffuse light to these apartments.

The board room, a spacious apartment of dimensions 50 by 30 feet, is

partially panelled in fumed oak and the walls are formed into a series of recesses by detached oak columns supporting the coffered ceiling.

Other portions of the main floor are taken up by the extensive coal selling and shipping business, and the various administrative offices requiring proximity to the direction, while the public counters, on pedestals of grey marble, extend into and occupy the western end of the central court.

The height of all enclosed apartments on this floor is eighteen feet.

The second floor provides ample accommodation for the Chinese and the accounting departments the rooms of the principal Chinese officials of the administration being finished in parquetry flooring, oak panelling and with concealed lighting effects.

The third floor affords accommodation for other subsidiary departments and leaves a substantial reserve for extensions in the future.

All the floors and the very extensive flat roof are connected by two electrically-driven six-passenger elevators. The hot water heating is from a two-unit installation deriving its power from small boilers of the Lancashire type: the treatment of sewerage by the modern septic process ; the expulsion of all waste water and sewerage by pressure through a metal pipe communicating with the river and the use of the most modern appliances for ventilation, signalling and electric lighting.

The total estimated cost of the construction of the head offices is approximately half a million dollars, exclusive of the value of the land.

International Finance and Exchange, Inc.

A FORMAL announcement of international interest appeared recently in the *Manshu Nichinichi Shimbun* concerning the establishment of the International Finance and Exchange, Inc.

According to the articles of association, as registered with the American Shanghai court, exchanges necessary for dealing in merchandise, share stocks and currencies, in China and the other parts of the Far East may be founded. Transportation by railways, the construction of roads, canals, waterworks, telegraphs and telephones in China, Manchuria and Mongolia may be undertaken. Mining, fishery, agricultural, forestry and manufacturing industries, too, in the same regions are to be taken up. In addition, the installation of blast furnaces, electricity and other motor power, lighting services, wet docks, wharves and elevators of all kinds, and the erection of hotels and warehouses, with their management, and trading, etc., are to be undertaken as financiers. Banking business, issue of debentures, guarantee of payment, guaranty and trust business, exploiting of special privileges, etc., are also included in the new Company's sphere of operation.

OFFICIALS : On the management are mentioned the following names :—

Mr. Edwin W. Mills (American), organizer; Mr. S. Hayakawa (president, S.M.R. Co.), controller; Mr. T. Murano (president, *Manshu Nichinichi Shimbun*), chairman, committee for opening business; Messrs. Ohi, Namba, Sugino and Soyejima (standing committee); Messrs. Minami, Koike, Kanda, G. Mochizuki, Tokuda, Iwai, Mayeda, Kataoka, Takase and over twenty others (on the committee).

CHINESE REPRESENTATIVES : Mr. Yang-tu (high adviser to the president of China); Mr. Chou Tzu-chi (ex-minister of finance); Mr. Chang Kuo-chuan (president, administrative litigation court); Gen. Yen Chi-han; Gen. Hsu Shao-chen (chief of general staff of the Canton government); Gen. Lu Kung-wang (ex-military commander of Chekiang; Mr. Wu Tiao-ching (financier of Tientsin); Mr. Tsung Wei-chen (ex-senator); Mr. Cheng Chao-chi (capitalist residing abroad). In addition, some dozen names of note are on the list. It is understood that on the complete establishment of the new Company, a board of directors is to be nominated on the recommendation of Mr. S. Hayakawa (president, South Manchuria Railway Company), who is also the supreme adviser.

AIMS OF NEW CORPORATION : China, in the post-war times, has turned the central market for the world's economic exploitation, where businessmen of all nations are in competition. It would be against the interests of these countries to be carried away by petty jealousies into discord, for such will only convert China into a theatre of commercial warfare. This will impede the future development of China. If the inexhaustible resources dormant in China should be tapped by international co-operation on common capital, the results to be reaped will be immense, to be shared by all countries. Our present effort is to realize this ideal for investment in all kinds of enterprises on a joint management system, and to develop the natural resources of China, to the end of drawing closer the international relations of China, at the same time setting an example of promoting an undertaking of mutual good to the powers.

CAPITAL AND SHARES : The Company's capital was Y.1,000,000, at the start; it has been raised to Y.20,000,000, divided into 1,000,000 shares of Y.20 each. The first quarterly payment of Y.5 per share is to be completed during February, 1922.

PROSPECTUS : To begin with, the new Company is to set up at Tientsin an exchange transacting in gold and silver currencies, merchandise stocks, share stocks, etc. It will besides engage in financing and trust business, accepting stocks as security. The cultivation of cotton, etc., will be also invested in.

The sphere of operation is to be gradually extended to Shanghai, Hankow, Canton and other places that may be deemed desirable.

As to the business returns, even from the exchange and trust business at Tientsin alone, a dividend of more than 20 per cent. to the capital paid up is expected to be distributed.

SPECIAL CHARACTERISTICS OF NEW COMPANY : (1) CURRENCY BUSINESS : To China, a silver standard country, some auxiliary institution is necessary in doing business with gold standard countries, for the purpose of providing beforehand against possible fluctuations of exchange rate. At present, most of business carried on on the currency exchanges of China consists of spot or short-termed business, and there is no adequate medium to cover forward contract deals. The new Company is to fill this need, and offers the facility of concluding long-termed contract deals in terms of the liberal American law.

(2) FLOTATION OF DEBENTURES : In terms of the articles of association, the Company is authorized to issue debentures, and, as occasion demands, low interest capital may be absorbed for investment in ventures of any magnitude.

(3) SPECIAL BUSINESS PRIVILEGES : For the establishment of exchanges at various places in China, the Company has such a concession established in a general way. Therefore, even in case of opening business in any new quarter, no company need be founded separately for the purpose, but a branch or an agency of this Company may be entrusted to set about the work.

The American law imposes but a nominal tax on the business put through, so this is a decided advantage scored over the rival corporations.

HEAD OFFICE : The head office is located at Peking, China. Offices are expected to be opened in French Concession, Tientsin, in the Canton Road, Shanghai, and in the British Concession, Hankow. An office has been opened on Himono-cho, Nihonbashiku, Tokyo.

大正七年七月十日第三種郵便物認可

APR 18 1922
APR 18 1922

THE FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE

上海仁記路第五號

遠東時報

TOKYO'S PROJECTED SUBWAY

NORTH CHINA COTTON INDUSTRY

THE NEW CANTON

ASIATIC STEEL WORKS

FIJI ISLANDS SUGAR

AUTOMOTIVE SUPPLEMENT

AIRCRAFT IN 1921

TRANSPORTATION IN CHINA

THE FUTURE OF THE MOTOR LORRY

Vol. XVIII MARCH, 1922 No. 3

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Convex Discs and Seats insure a continuous contact all the way round the seat.

FIG. W3253
GLOBE CHECK VALVE

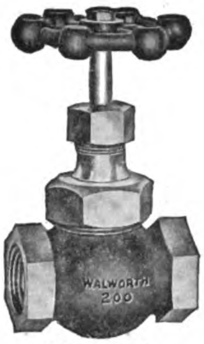

FIG. W3251
GLOBE VALVE

FIG. W3261
FLANGED GLOBE VALVE

FIG. W3252
ANGLE VALVE

They can be reground on the line without disconnecting.

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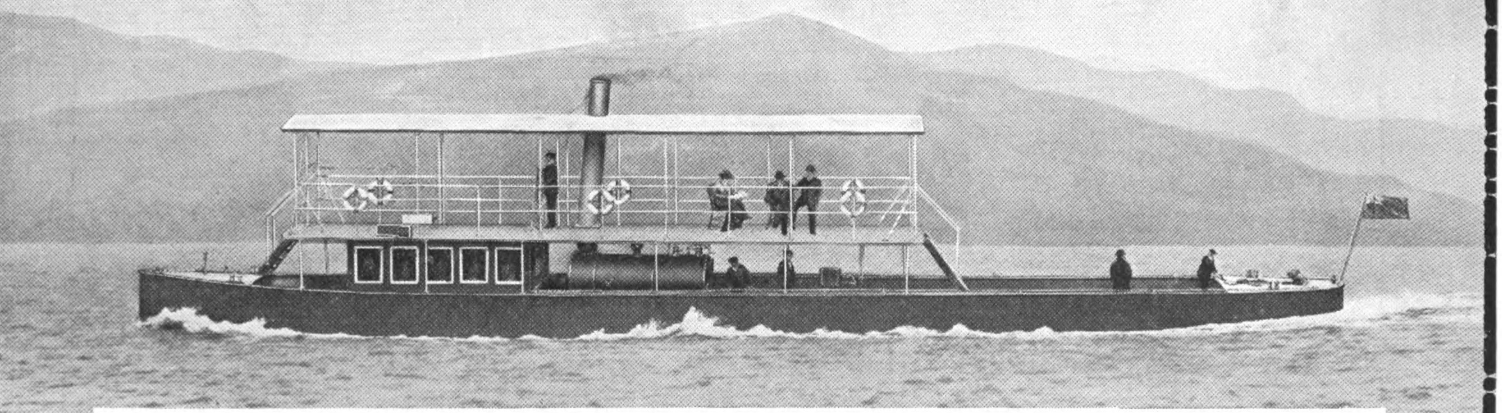

Length, 160-ft.; Beam, 24-ft. 6-in.; Draft, carrying 40 tons, 2-ft. 3-in.; Speed, carrying 40 tons, 15 Statute miles an hour, burning wood fuel only.

Vessel as above illustrated can be shipped whole to any part of the world.

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RIELLEY, SIMMONS & MILNE, Agents, Shanghai.

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, MARCH, 1922 No. 3

TOKYO'S PROJECTED SUBWAY

THE TRANSPORTATION PROBLEMS OF JAPAN'S CAPITAL

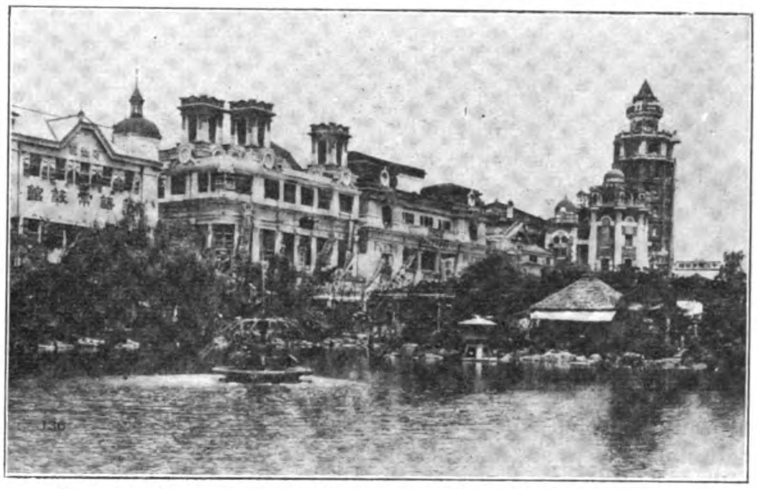
Plans and Prospects of the Tokyo Underground Railway Co., Ltd.

By H. C. Hugins, Professor of Economics, Keio Gijuku University, Tokyo, Japan.

TOKYO, the fourth city of the world to-day, stands in the most dire need of the immediate construction of some kind of rapid transit system which will solve its almost desperate transportation problem. The Japanese people, although they keenly feel that something is very wrong with transportation equipment in the big towns and cities, are unfortunately so geographically isolated from the developments of Europe and America, that they are slow to realize that for many years past, such systems have been in successful operation for them to use the city tram lines to travel about in. The common people walk, and that well-to-do ride in ricshas, or automobiles. It is most noticeable that it is the middle class alone to whom the doubtful pleasure of riding in Tokyo trams is to-day almost exclusively confined. Resulting from these conditions the Tokyo municipal railway system carries only a very small part of the population of the city. In Paris the average number of rides each resident of the city makes each year is 230, in Tokyo, where population is equal to that of Paris, the average number of rides is only 113 a year.

ASAKUSA PARK. TOKYO'S GREAT PLAYGROUND, LOCATED AT THE EXTREMITY OF THE CAPITAL, ATTRACTS HUGE CROWDS DAILY; A TRANSPORTATION PROBLEM OF THE FIRST MAGNITUDE

The shopping street, where wheeled traffic is prohibited, leading to the Kwanzeon Temple in Asakusa Park



A part of the Amusement Centre of Asakusa Park, showing the 12 story pagoda

abroad, and they are slower still to demand improvements in the present ramshackle and broken-down system which no longer even make a pretence of being adequate to serve the ever-growing populations of the urban centres.

A distinction between country and city, urban and suburban, is not yet acutely drawn in Japan. Office districts and residence districts are not distinguishably separated, and business is carried on in the homes of many tens of thousands of Tokyo residents. In consequence of this lack of distinction between "up" and "down" town the greater number of persons, who crowd to the utmost limit of endurable capacity the trams of the Tokyo municipal railway bureau from morning till night, is principally made up of national and municipal officials and clerks, students, laborers and clerks in private employ, going to and coming from their day's work. Women in Japan are conventionally expected to have little to do outside their own homes, so there is little, if any, need

Up to a few years ago, ever with all its inadequacies of equipment, the surface transportation system in Tokyo was quite complete enough for the uses made of it by the city's population, but now, since the great growth of the city from the influx of labor with the years of war and post-war prosperity, in the Ginza district (the retail district), in Marunouchi (the new banking centre), and in Nihonbashi (the wholesale district), many large office buildings built in the past five years, attract tens of thousands of persons every day. They must all use the city's trams twice a day, at least, to carry them to and from their work. Women are now even leaving the home to take employment as clerks, and where ten years ago one woman rode on the trams in company with fifty men, to-day the number of each sex using them is almost equal. The old systems are bending under the strain of modern industrialism, systems both of transportation and society, and can no longer bear without cracking the demands made upon them.

It is no exaggeration to call the Tokyo municipal railway system hoplessly antiquated. The operation of the trams is simply atrocious: the actual condition of the trams themselves is almost beyond the ability of those who do not have to come in daily contact with them to comprehend. And with all this the whole future of the capital city of Japan, Tokyo, depends upon an immediate betterment, and extension of the present system. Even the Japanese people, so unused to consider time of any importance in their lives, are waking up to the fact that some rapid way of getting about Tokyo's streets is essential to the city's progress, and their own comfort and welfare.

Official Plans for a Greater Tokyo

Just at the present moment the Tokyo municipal authorities and a few influential citizens in close touch with official activities are loudly advocating a greater Tokyo, without any very clear idea on their part of what a greater Tokyo actually means, or what will be required to bring it about. It is not pessimism, but the teaching of the actual facts which makes it evident that a greater Tokyo is a practical impossibility unless a radical change takes place in the city's transportation systems.

The boundaries of Tokyo municipality enclose an area of 300 square miles, 837,972,000 square feet, the population of the municipality was estimated at 2,330,000 in 1921; each person in the city would have 360 square feet in which to dwell. In Paris and Berlin populations are about the same in density, but those cities buildings are from six to ten stories high, and this added space is available for dwelling places so that each person has a much greater average dwelling place than the citizen of Tokyo.

The international conference of insurance men held in 1908 expressed the opinion that it was impossible to safeguard the health of city dwellers where the space potentially available for each individual was less than 1,440 square feet. If this is taken as a standard, the population of Tokyo is living in very unhealthy surroundings indeed; while in the city's present area, it is utterly impossible to maintain the health of the present population, let alone an ever growing one. Even if Tokyo were adequately equipped with water supplied from central reservoirs, and even though a modern sewage and drainage system were installed, along with many other improvements needed to make it a thoroughly sanitary modern city, in the present limited space the municipality is crowded into, it is impossible to expect individuals to live in perfectly healthful surroundings.

The greater Tokyo plan contemplates making the district lying between Tokyo central station in Marunouchi, and Nihon Bashi (the bridge not the district called Nihonbashi), the centre of the new city which will extend outward in a circle having a radius of ten miles. This very ambitious plan has been advocated and almost adopted without any consideration having been given the city's urgent transportation needs. To go from any part of the circumference of this ambitious circle to the centre of the greater Tokyo takes, on the present tram lines, at the very least one hour and a quarter. In this day, even for a Japanese business man, to spend two hours and more a day on the trams between his office and his home is entirely too much of a good thing, and the business men know it. In this day of hustle and bustle, which has even slightly infected Japan, it is impracticable to live farther away from a city's centre than a half-an-hour's easy ride. Practically, as well as theoretically, half-an-hour is about the limit of travel a city's farthest boundary may be from its business centre.

In London, present transportation systems enable the business man to travel to his work at a speed of four to ten miles in half-an-hour. In Paris he can cover from four to eight miles in the same time. In New York the speed of trains is from four and a half to eleven miles, and in Chicago from five to seven miles in half-an-hour. In Tokyo there are no other cheap, means of getting about than those offered by the municipal surface tram lines, so that it is impossible to cover more than three and a half to four miles in half-an-hour. That is the theoretical speed of Tokyo municipal trams, but because streets are crowded with other vehicles, trams are outrageously delayed in their running times, and they are, in practice and then but seldom, able to cover more than six miles an hour. It is not difficult to conceive that a greater Tokyo with no more than the present transportation systems at its disposal will be very much of a dismal failure.

VIEWS ON THE GINZA, TOKYO'S MAIN BOULEVARD

Matsusakaya Department Store

The Ginza, looking North

Inadequacy of Surface Lines

Tokyo municipal railways to-day are in a hopelessly confused muddle, badly routed, badly operated, and crowded beyond endurance every hour of the day and night. With a population equal to that of Paris Tokyo has only 180 miles of surface lines, while in Paris there are 1.020 miles of surface lines. The difference is too great for the Japanese to contemplate with any equanimity. As overcrowding is the most visible shortcoming of the municipal service, it is popularly supposed that all that need be done to improve the service is to increase the number of trams operated regardless of the fact that the present, track, wire, and power house equipment makes any increase in the number of trams operated a physical impossibility. Theoretically the track and power equipment will operate a maximum of 12 trams on each mile of single tiack. Even if it were possible to increase the number of trams on each mile of track to fourteen by despatching them at intervals of 36 seconds—and it is not even suggested that this is possible—the present highest speed of eight miles an hour would automatically be lowered to seven miles an hour, and running fourteen trams a mile the system

would carry fewer passengers than the twelve trams now operated. Experience has definately proved that the equipment of the municipal railways can operate only twelve trams per mile, but this limitation applies only to the line between Shinagawa, along the Ginza, to Ueno and Asakusa Park, the main traveled line of the city. The whole city system will average only 7½ trams to a mile of single track.

On the 180 miles of track operated the greatest number of trams running at one time is theoretically 1,350. But in actual practice it is impossible to run more than 1,000 to 1,200 a day. Only a very few more trams could possibly be added to the number now run, maybe 150 to 240 could be added without absolutely disrupting the present imperfect system.

In 1909 the population of Tokyo was 1,620,000. In 1917 it had increased to 2,350,000. The average annual increase between these years was 91,000. During the same years the population of the suburbs and country districts in direct touch with the city's centre through the service of the municipal tramways, increased about 50,000 a year, making the total increase of population in and around Tokyo about 140,000 a year. In 1915, each person living in Tokyo rode on the trams 116 times. In 1918 the annual number of trips had increased to 145. The city's population is growing. while at the same time the number of rides each person takes is also increasing. It is easy to understand that the present transportation equipment of Tokyo city is absolutely out of keeping with the city's needs.

Motor Bus Lines

In the greater Tokyo which is growing up all around the old Tokugawa Yedo, a system of rapid transportation running from one end of the city to the other is gradually becoming more and more necessary to the progress of the city. To supplement the existing surface lines, and to relieve the congestion on the main lines of traffic, several motor bus lines have been opened in recent years by private interests. But despite the great need of the service they offered, the company operating the existing bus lines has been far from successful. Tokyo roads are uniformly bad, and their miserable paving makes riding on them more of an act to be endured than a pleasure, while as a vehicle of transportation the usefulness of the auto-bus is limited by the restrictions on their size and height. Expenses of operation are almost prohibitive, and it is generally believed that no great extension of their use can be expected in Tokyo until the paving of the roads is radically bettered, and the low-hanging electric wiring of the city is planted underground where it belongs. The Tokyo Shigai Jidosha Kabushiki Kaisha (Tokyo City and Suburban Automobile Co., Ltd.), despite its monopoly of passenger bus transport on the Tokyo streets is in rather a bad way financially, its last two dividends were passed, and its equipment is going from bad to very much worse without any attempt being made to keep it in adequate repair.

Any extension of motor bus lines is almost unthinkable, so it becomes more and more apparent that the solution of Tokyo's traffic problems is to be found in an elevated or an underground

Nihonbashi Bridge, The Centre of Tokyo, looking South

At the Entrance of Uyeno Park, looking down Uyeno Broadway

Without increasing the number of transportation systems, or introducing rapid transit lines, there are theoretically five ways of making a change that will relieve the situation and benefit the city (1) by increasing the number of trams operated; (2) by building and operating longer trams; (3) by building and operating wider trams; (4) by building and operating trams with upper decks; (5) by using trailers.

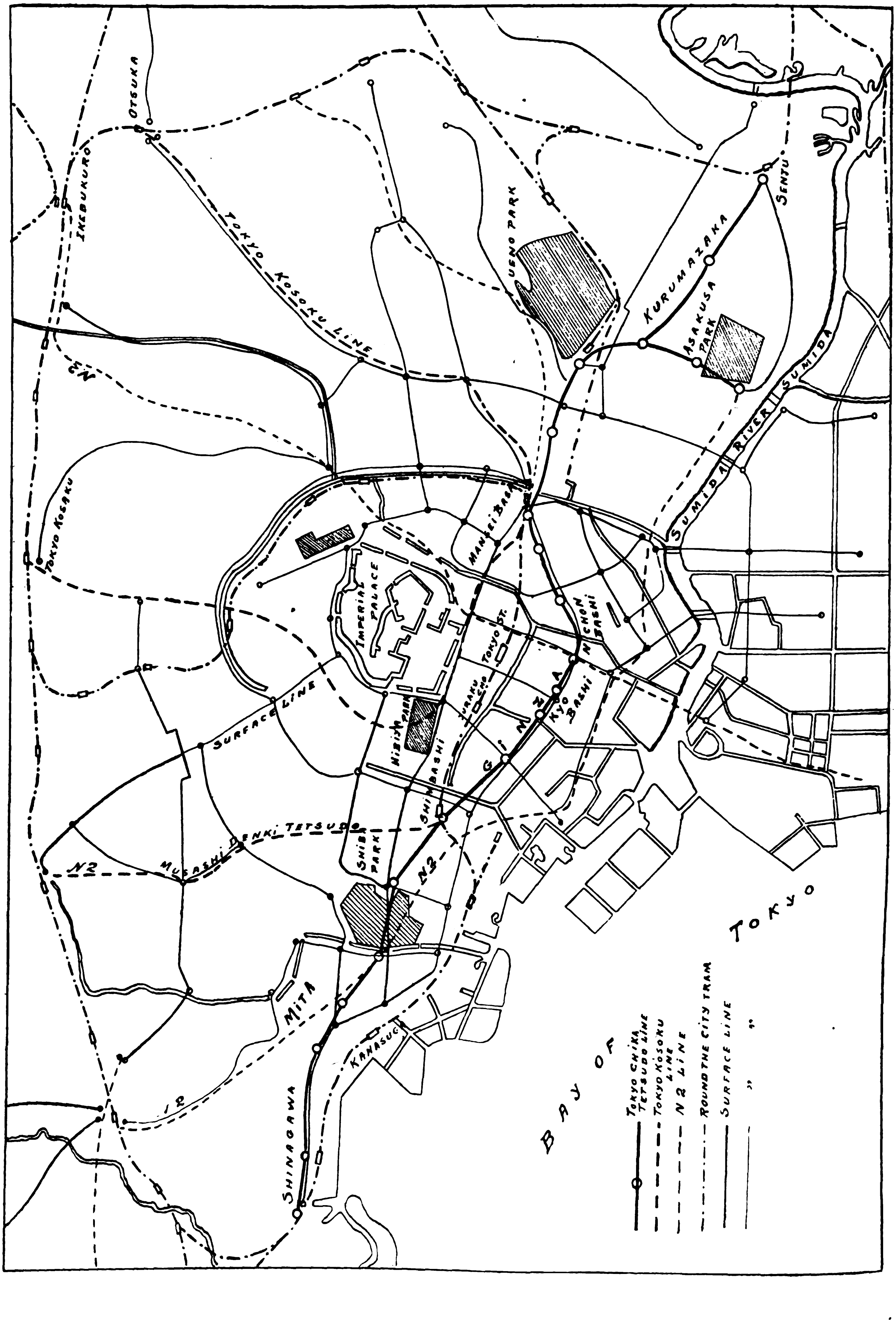
But there are many difficulties in the way of laying a net work of tram lines all over Tokyo. The city streets are too narrow to accommodate tramway rails and the ordinary traffic on all Japanese streets as well. Longer trams than the new bogey type now in use cannot be handled on the narrow streets where the present lines are always turning corners very closely cut; and because the streets are narrow the gauge of the lines is narrow also, so wider trams cannot be adopted. It is not feasible to use "double-deckers" in the Tokyo streets, because of the low hanging wire equipment of the city's light and telephone services. Trailers too are impracticable because there are so many hindrances to their successful operation in the crowded streets, that their employment would be more of a detriment than an advantage to the present system. Viewed in this detailed manner it becomes apparent that it is essential that some other system than the present surface lines be put in operation if a solution of Tokyo's transportation problems is to be reached.

railway. Tokyo absolutely needs some rapid transit system installed at once. The elevated and the underground systems seem to be the only ones remaining which can be given serious consideration.

How About an Elevated Line?

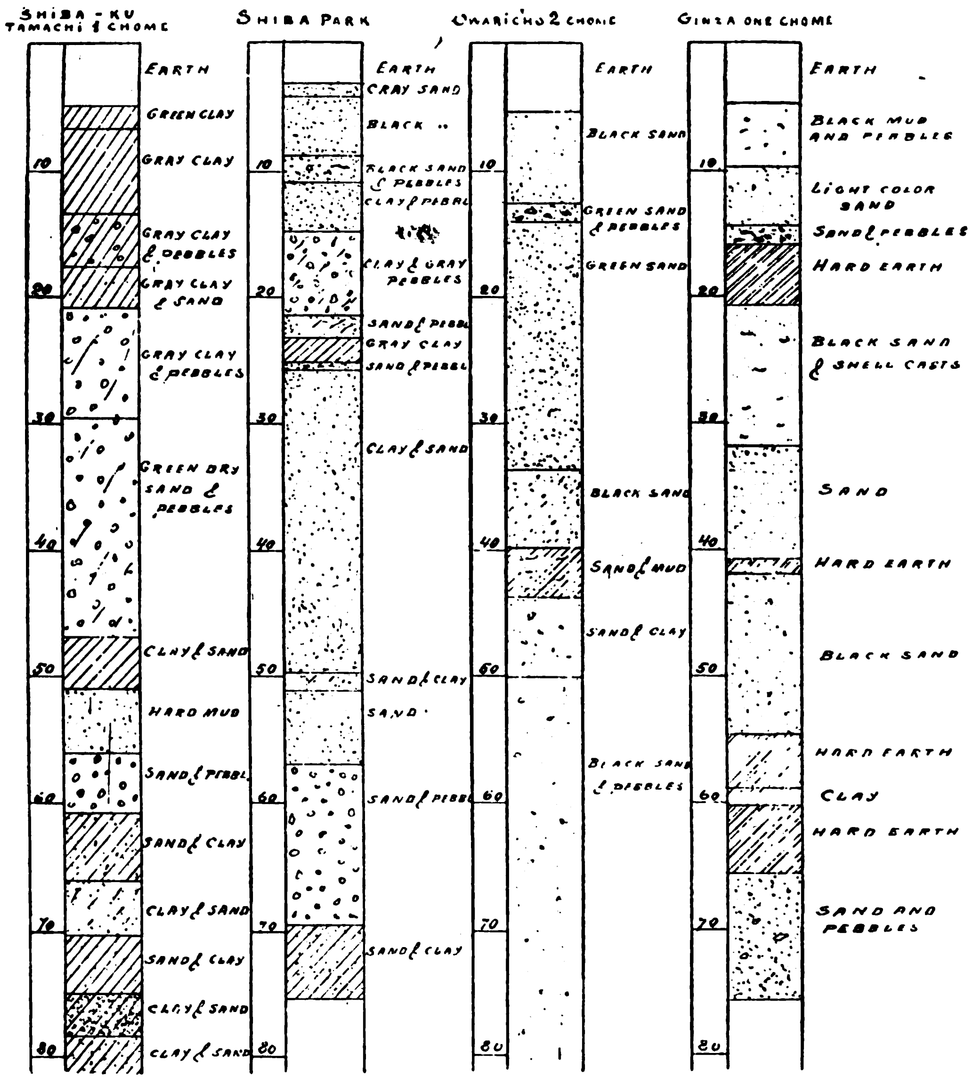
It is generally conceded that an elevated system would not be suitable to a Japanese city. Japanese houses are very low; in Tokyo the average building is but one story high and the roofs are not very far above the ground. An elevated system would necessarily be built high above the level of the city's roofs. Tokyo is a windy city, and at all times of the year, a dusty one. Even the present limited elevated system from Shimbashi station to Manseibashi station in the heart of the city, is a source of complaint because dust stirred up by the passing trains blows into the houses along the line. People object to the noise and shaking of the elevated. Furthermore, it would be almost impossible to build an elevated line through the awful tangle of wires which crisscross every Tokyo street in hopeless confusion. The final and most important obstacle of all is the expense of buying the right of way. To build an elevated adequate to satisfy the city's needs for local and express service would require such a wide road-bed that any private undertaking constructing an elevated railway system would be confronted first of all with the prohibitive expense of buying land on both sides

ROUTE OF PROPOSED TOKYO SUBWAY



of the line traversed. The cost of the right of way would make an elevated prohibitive, and even the Y.4,000,000 a mile estimate for an underground line fades into complete insignificance before the enormous sums an elevated line would expend before an inch of the line itself could be constructed. To-day, it has become the concensus of opinion amongst traffic men that the solution of Tokyo's transportation problem lines only in an underground line. The problem of the underground has been solved by the investigations of the Tokyo Chika Tetsudo Kabushiki Kaisha (Tokyo Underground Railway Co., Ltd).

The imperial railway department, it is true, operates a short elevated line from the entrance to the city on the south, near Shimbashi station to the Tokyo central station, and thence to Manseibashi, and out towards Yotsuya and Shinjuku, in all ten miles of elevated railway. But the only part of this ten miles which can properly be called an elevated rapid transit service is that between Shimbashi and Manseibashi, 2.4 miles. The seat of the railway department's elevated lines is really only an elevated roadbed for ordinary railway traffic which was not constructed with any idea of a high speed transport service in view. Consequently they have no connection at all with the main lines of city traffic, and are of no real assistance in helping out the jumble in the city's traffic situation.



Result of Borings for Tokyo's Subway System

Proposed Underground Railway Systems Licensed

In 1919 a great impetus was given to all kinds of company promotion by the tremendous increase in investment funds produced by war-time prosperity, and enterprising professional promoters were not slow to hit on the scheme of building underground railways in Tokyo. Almost at the same time, one license after another was granted by the Tokyo municipality and the imperial railway bureau.

The first license to build an underground railway line in Tokyo was granted to Mr. Toshimitsu Tsurumatsu, as promoter of the Tokyo Kosoku Tetsudo Kabushiki Kaisha (Tokyo Rapid Transit Railway Co., Ltd.), then the Tokyo Tetsudo Kabushiki Kaisha (Tokyo Railway Co., Ltd.), promoted by Mr. Iida Guchi, and the Musashi Denki Tetsudo Kabushiki Kaisha, promoted by Baron Senosuke Goh, president of the Tokyo stock exchange, were issued. Since the licenses were granted, however, nothing further has been heard of these three companies. The Tokyo Chika Tetsudo Kabushiki Kaisha (Tokyo Underground Railway Co., Ltd.), promoted by Mr. T. Hayakawa, was organized in August 1920, and at once began an active survey of the route for which the license had been granted. In February 1921 a survey of the soil along the line of the first line planned to be opened was begun, and completed in September 1921. Despite the handicap of the hard times which began almost immediately after the promoters first planned the company, and which have continued ever since, the directors of the organized stock company have continued uninterruptedly to pursue the original purpose of the promoter, which was and is, to build an underground railway in Tokyo which shall relieve the present congestion on all the city's surface lines. From the very inception of the idea the Tokyo Chika Tetsudo's promoters have been fighting against almost unsurmountable difficulties. First of all, no one in Japan knew anything about underground railways, their construction and operation, and no one seemed to care much about them either. For Mr. Hayakawa, who is neither an engineer nor an ordinary promoter, wished to build a tube, not merely promote an underground railway company. Mr. Hayakawa is a man of great ability whose mind is of the constructive type. He was struck with the growing transportation needs of Tokyo as far back as 1913, and went to Europe to study the problems of transportation in great cities. His studies only tended to confirm him in a belief that the solution of Tokyo's transit problem lay in an underground system, which would act as a long-distance carrier to relieve the long haul traffic on the city's overcrowded surface lines, and which would eventually be extended to tap important outlying districts of Tokyo, particularly the suburban railway stations. Mr. Hayakawa returned to Japan in 1919, at the height of the boom, to lay the results of his investigations before certain of his acquaintances who ultimately became animated with his enthusiasm for the project. The Tokyo Chika Tetsudo is the result.

The routes approved for exploitation by the companies licensed are given in detail in the following table, and reference to the map will show their relation to the important centres of Tokyo city.

1. Tokyo Kosoku Tetsudo Kabushiki Kaisha.
   (Tokyo Rapid Transit Railway Co., Ltd.)
   From Otsuka to Manseibashi, Hibiya, and thence to Shinjuku.
   Total: 8 miles, 60 chains.
   Cost of construction, estimated Y.37,000,000.
2. Musashi Denki Tetsudo Kabushiki Kaisha.
   (Musashi Electric Railway Co., Ltd.)
   From Shibuya to Hibiya.

Total : 5 miles.
Cost of construction, estimated Y.20,000,000.

3. Tokyo Chika Tetsudo Kabushiki Kaisha.
(Tokyo Underground Railway Co., Ltd.)

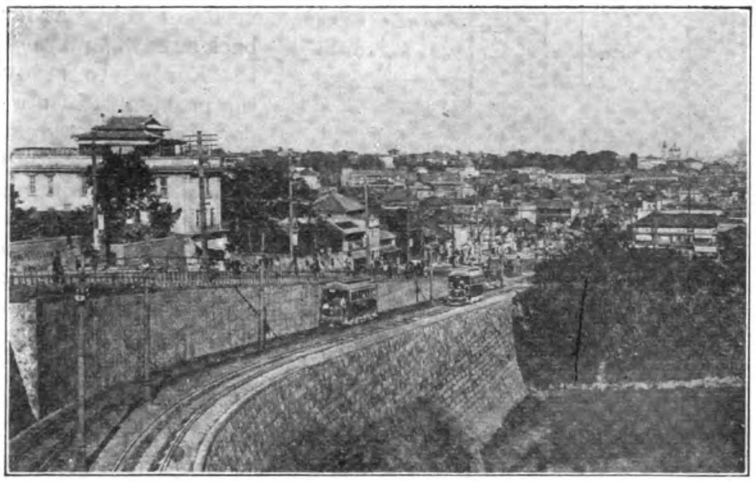
1st Line.

From Shinagawa to Shimbashi, Suda Cho, Uyeno, and Asakusa Park : thence to Minami Senju.
Total : 9.47 miles.
Cost of construction, estimated Y.40,000,000.

2nd Line.

Part 1. From Meguro to Tsukiji-Oshiage, the terminus of the Inter-urban Line, Tokyo-Chiba.
Part 2. From Ikebukuro to Takadanobaba-Iidamachi, Otemachi, and thence to Suzaki.
Part 3. Sugamo to Manseibashi.
Total : 20 miles, 60 chains.
Cost of construction, estimated Y.92,000,000.

The proposed line of the Tokyo Tetsudo Kabushiki Kaisha (Tokyo Railway Co., Ltd.), has not been published, and the company seems to have fallen out of sight since the slump in March, 1920.



The Business District of Kanda, Tokyo

It has already been said that there was no one in Japan with any knowledge of underground railway problems when Mr. Hayakawa put his ability at the disposal of his friends, and it might truthfully be said, his city. Shortly after the Tokyo Chika Tetsudo was organized privately in 1919, several engineers were engaged by the company to go abroad and study underground construction. No work was then going on in any European city except Madrid. And it is the Madrid underground which will be the model for the Tokyo tube.

The Tokyo Chika Tetsudo Kabushiki Kaisha

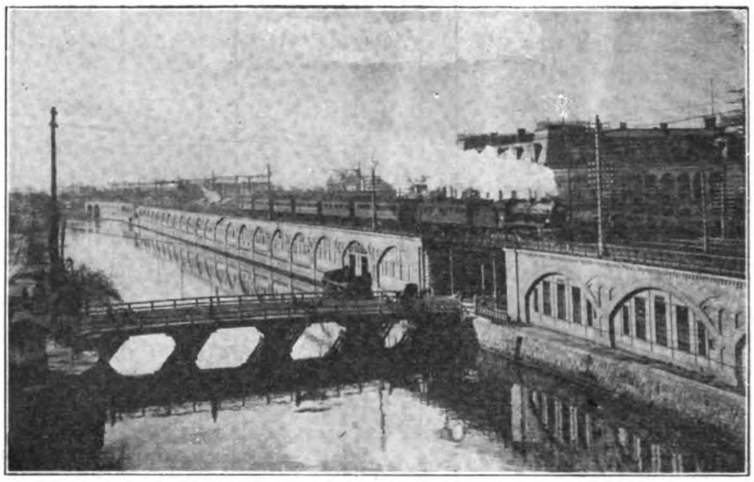
The slump which began in April 1920 effectually put a stop to any plans of soliciting public subscription for the shares of the Tokyo Chika Tetsudo. Mr. Hayakawa and his associates are all men of the highest standing and have the confidence of the whole financial world, but the panic stopped all talk of building an underground, while doubts which in the time of prosperity for company promoters were unexpressed, and which had little weight even of expression in those days, were openly entertained of the feasibility of building such a transportation system in the Tokyo " mud." It was feared that the tube would sink in the mud, or that it would be flooded by the waters of the rivers it must pass under, or earthquakes would destroy it, etc., all of which criticisms the company's promoters foundi t very difficult to answer until they had finished their preliminary survey of the soil along the route projected.

Tokyo Soil Conditions

No accurate data could be found anywhere on which to base an estimate of the engineering problems to be solved in building the proposed undergroundr ailway. The imperial railway department did have some specimen borings taken from the city's streams and canals which the present elevated system crosses, that showed a soil formation not at all complicated from an engineering standpoint. Upon these borings Mr. Hayakawa based the feasibility of his plan. Results of the detailed survey have proved the correctness of his suppositions.

When Tokyo people first heard of the underground railway plan they were much impressed with the novelty of the scheme, but when this wore off, they began to ask if the soil, the city was built on, would hold such a heavy tunnel. Wouldn't the city wake up some fine morning and find the tube sunk in the mud the city is popularly supposed to be built on ? Everyone knew that the surface trams and buses were always full, the success of such a scheme was a foregone conclusion, if it could only be made safe.

The Tokyo Chika Tetsudo declined further promotion, sales of stock, to raise funds, or advertising even, until the geological surveys should show exactly what the engineers were going to have



Elevated Railway, near the Tokyo Central Station

to face in constructing the tunnel, and its probable cost. In places the soil of Tokyo is certainly very soft, but the result of all the borings along the route of the first line planned is most satisfying and has revealed a condition much better than the geological experts of the imperial railway department and the imperial university expected. The opinion of several experts runs as follows :

" Along the line of the projected Tokyo Chika Tetsudo, the result of the examination has shown unexpectediy good conditions to exist. Specialists anticipated that it would be impossible to build such a tube, but the present survey has dissipated all their doubts. Several localities are nevertheless unsatisfactory, notably Shiba Park, the district between Satsumaparra and Kanasugi Bashi, and the district between Asakusa Park and Kikugawa Bashi. In these places the soil is weak, and it will be difficult to work in, but nevertheless it presents no insurmountable difficulties to underground railway engineers. Thus it is seen that the general opinion of the people that such an enterprise is an impossibility, is a mistaken one."

Fears that the tube might sink in the mud in soft places are unjustified by engineering experience. Pressure from below will support a tube just as the Hudson River tube is supported. The problem of construction is not a probable sinking of the tunnel, but one of accurate engineering construction which shall meet the difficulties of working in such places. The greatest difficulties the engineers will encounter will be in building the connecting links between the firm solid soil and the soft shifting mud seams which

will be encountered in Shiba, and under the rivers and canals which must be passed along the line between Shimbashi and Uyeno.

Geologists have found that the soil of Tokyo is composed as follows:

Surface to 10 feet below.—Sand with pebbles: or clay with pebbles.

10 to 20 feet below.—Clay, grey or blue or brown or yellow.

20 to 40 feet below.—Clay or sand with pebbles.

40 to 60 feet below.—Shell casts, with sand seams and pebbles.

Consequently the seam forty to fifty feet below the surface is the most desirable one in which to build the tunnel. Many persons fear inundation of the tube, but the permeation of water through clay seams will be so slight that it can be kept down to almost nothing at all by high power pumps. So this objection has also been answered.

The results of four borings made at another four places than those shown in Diagram 1, are given below:—

1. Kyobashi Ward, in front of Shimbashi Station.

Soil	Depth.
Grey sand	4.6718 feet
Green sand	3.6778 ,,
Sand mixed with pebbles	2.9820 ,,
Clay mixed with sand ...	7.7532 ,,
Green clay	6.2622 ,,
Green sand mixed with clay	1.1928 ,,
Green clay	4.4730 ,,
Green sand mixed with Clay	2.9820 ,,
	33.9948 feet

2. Nihonbashi Ward, Nihonbashi 1 chome.

Soil	Depth.
Mud	5.2682 feet
Shell casts with pebbles	1.7882 ,,
Green clay	2.3856 ,,
Yellow clay	1.4880 ,,
Sand and clay	5.0694 ,,
	15.9994 feet

3. Nihonbashi Ward, Nihonbashi 4 chome.

Soil	Depth.
Thin black mud ...	5.6658 feet
Green sand	4.5724 ,,
Coarse sand with some properties of clay ...	1.9880 ,,
Yellow clay	2.4770 ,,
Light green clay ...	9.1448 ,,
Sand mixed with clay...	8.9460 ,,
Brown clay	5.1680 ,,
Sand mixed with clay...	2.6758 ,,
	40.6378 feet

4. Kanda Ward, Imagawa Bashi.

Soil	Depth.
Black mud	1.7892 feet
Green clay	17.9911 ,,
Sand mixed with clay ...	11.6298 ,,
Brown clay	2.8826 ,,
Sand mixed with clay ...	3.1808 ,,
Green clay	5.8646 ,,
	43.3381 feet

(*Note.*—Borings taken in cold weather).

All question of the ability of these strata to bear heavy weights is solved as a consideration of the following table worked out by actual experiment of the Tokyo Chika Tetsudo engineers will show:—

Loading Capacity of Tokyo Soil, per square foot.

	At Surface	20 feet below surface.
River bottom mud	½ ton	1½ tons
Suburban district earth ..	1 ,,	3 ,,
Clay seams (wet)	4 ,,	6 ,,
Clay seams (dry)	6 ,,	8 ,,
Sand seams	3 ,,	6 ,,
Hard Sand Seams	4 ,,	8 ,,
Sand and pebbles mixed ..	8 ,,	12 ,,
Pebbles	5 ,,	10 ,,
Clay and pebbles mixed ..	10 ,,	10 ,,

(*Note.*—Ton of 2,240-lbs. sq. foot, is Japanese sq. *shaku*, equals 0.994 sq. ft.)

The borings carried out along the line of the first tunnel planned by the Tokyo Chika Tetsudo shows that from Shinagawa to Mita (see map), the soil is composed of mixed clay and sand seams which have a very high load capacity, and gushing springs are almost entirely absent along this part of the line. This makes it possible to dig the tunnel in a space only big enough for its own tube, or, as planned, from the surface like a ditch. Either method is applicable to the conditions discovered between Shinagawa and Mita.

From Mita to Shimbashi the soil is very complicated, but for the greater part of the proposed line it is composed of sand-pebbles, and sand-clay layers. These seams are strong. From Satsumaparra to Kanasugi, however, the soil is very weak, but even along this section it is possible to build an underground without much difficulty. If the line is dug a bit away from the bay shore into Mita Ward, it will be a very simple piece of work to get from Mita to Shimbashi through soil easy to build in.

From Shimbashi to Uyeno the soil is all good. For forty to fifty feet below the surface all the strata are sand seams. Below fifty feet there are strata of pebbles, and then of hard clay. In some places there are even some seams of very soft sandstone. Along this section of the proposed line there are four rivers which must be passed. Strange to say the soil in their vicinity is especially good, and at Shimbashi, Kyobashi, and Nihonbashi, along the river bottoms there are stiong compact strata of hard clay, and sandstone, excellent media for underground railway tunnel construction.

The most difficult places for underground construction are beneath river beds, but in Tokyo the soil in such places has proved exceptionally advantageous to such construction.

From Uyeno to Asakusa Park, the underground will follow the main surface lines, beneath the main street. The greater part of the way is composed of sand seams. The grain of the sand is even finer than that of the Ginz section (Shimbashi-Uyeno), and the load capacity of the soil is much greater. At Kikuya Bashi and in Asakusa, and in the vicinity of Umamichi there are some weak seams, but even these present no difficulties of construction. In these places it will be necessary to prepare the floor of the tunnel by driving piles to strengthen the tunnel foundation. Compared to Marunouchi, where the soil encountered is generally weak, Kikuya Bashi is no worse. Yet in Marunouchi they are building many fine office buildings of immense weight, and there seems to be no difficulty about their foundations. If it were necessary to drive piles along the whole line to strengthen the foundation of the tunnel the cost of construction would be prohibitive, but fortunately the first line is to be built along a route where it will be very easy to construct the tunnel.

When one speaks of the underground to-day people at once begin to talk about the prohibitive expense of such an undertaking. But in actual practice this will not be so very great. A thorough examination of the soil has shown that it is better than that of Paris or Brussels, in fact that it is very good indeed, and the construction of an underground line will be much easier than it was at first anticipated it would be.

Details of Construction

The license issued to the Tokyo Chika Tetsudo Kaisha permits the company to build the greater part of its first line just under the main streets. These streets are from 108 to 126 feet wide, including sidewalks, and as the underground tunnel will be only 24 to 27 feet wide outside, in no place will it be necessary to build the tunnel under the buildings on either side of the street, except perhaps at stations.

The soil excavated will be used for reclamation work along Tokyo Bay, and the sale of the soil will effect a great economy in the cost of construction.

The first line will have its terminals in connection with the government railway lines to Yokohama and around Tokyo city, and the Tokyo-Yokohama electric railway line at Shinagawa, and with the Oji electric tram line at Senju. The ten miles planned will actually serve in practice several tens of miles more than its own line in each direction out of Tokyo. It should, therefore, be as profitable a business in the future, as it is now a hopeful one.

The London tube is 52 feet wide, and 15 feet 9 inches wide. The Budapest tunnel is 19 feet 10 inches wide, and 9 feet high. In Madrid, the box-type tunnel is 19 feet wide, and 14 feet high, while the horseshoe type is 22 feet 9 inches wide, and 15 feet high. The Paris tube is a double track type, 23 feet wide, 14 feet 10 inches high. The underground in New York is the widest in the world, the double track line being from 27 to 29 feet wide, and the four track lines being 53 and 54 feet wide, and 13 to 15 feet high.

The Tokyo tunnel will be 17 to 18 feet high and 24 to 27 feet wide, built in the box-type, of reinforced concrete. The regulations of the imperial railway department governing the construction of underground railways prescribes a tunnel which shall be 22 feet wide, inside, and 12 feet high. The track will be broad gauge, and for this it was necessary to obtain special governmental permission. The Japanese tunnel will be smaller than the American, but larger than the British and German types. Between the tracks there will be steel supports for the roof of the tunnel. From the floor of the tunnel to the surface of the street, will be exactly 20 feet.

Cars will be 35 to 50 feet long, and built all of steel. The average speed will be about 35 miles an hour. Stops of 30 seconds will be made at the less important stations, while at important ones a whole minute will be allowed. This is the present operating system on the imperial government railways electric lines about Tokyo, not often strictly adhered to! Including time consumed in stopping at stations the average run will be 20 miles an hour. Trains will be equipped to rush into high speed on starting, thus saving time, and accordingly the run from Shinagawa to Asakusa Park, 8 miles, will be made in 25 minutes. On the present surface trams one is lucky to make it in less than an hour and a half.

The maximum gradient will be 1 in 30. The shortest radius of curves will be 300 feet, but most of them will be from 500 to 1,000 feet. Abroad trains turn in a shorter length, and the gradient is much steeper. The type of construction planned for Tokyo will make operation very simple and inexpensive. Stations will be underground so that there will be no big expenses for purchasing land to build on.

If all the soil of Tokyo were like that from Shinagawa to Mita it would be a very simple matter to construct an underground line in Tokyo. But along the Ginza where the strength of the soil is quite sufficient to hold the tunnel, there are many springs whose waters will seep into the tunnel. Just what the degree of seepage will be it is not possible to determine, but because the tunnel is built on a level it will be necessary to equip it with high power drainage pumps, which should keep the tunnel dry. Only through the pebble seams is any particular difficulty with seepage expected, but following the experience of the builders of the Berlin tube, the Tokyo engineers will use high power pumps and thus expect to ensure a safe dry tunnel.

The roof of the tunnel will be from three to six feet below the surface of the street. It is intended to build the tunnel just as though a deep trench were being dug, and the top soil will be replaced when the concrete tunnel is completed. Under the rivers tunneling will be carried on in ordinary operations, the river bottom first having been filled with cement, making the river bed above the tunnel a mere concrete ditch. This will avoid caisson work so that in no part of the line will iron tube construction be used. The route planned for the second line will take it under the Sumida River, where it will, of course, be necessary to carry on tunnelling in caissons.

Three or four years ago some sewers were dug in certain parts of Tokyo, especially in Shitaya Ward, at Ryusenji and Mikawajima. The trench was dug from 20 to 25 feet below the surface, 15 feet wide, and the height of the sewer conduit was 8 feet. The conduit was made of reinforced concrete. Certainly if this sewer could be built in poor soil, the Tokyo Chika Tetsudo tunnel which will be a double line tunnel, with an outside width of 25 feet, and height of 17 to 19 feet, can easily be built even in bad soil. Stations, of course, will require larger spaces, but they need be only 12 to 13 feet high.

There are many lines of water mains and gas pipes laid beneath the surface of Tokyo streets. Generally they are only 2 to 3 feet below the surface, although in some places they lie as low as 5 to 6 feet underground. Compared to the depths at which such pipes are laid in many foreign countries, this is not exactly deep.

In two places on the Ginza which the main line will follow there are 7 such pipe lines now laid. Water mains 20 and 30 inches in diameter, gas mains 6 inches and more in diameter, and some sewer pipes 12 and 14 inches in diameter, and a few instruments of the Tokyo municipal railways and the Tokyo Dento Co. (Tokyo Electric Light Co.), are also buried under ground. From the Ginza to Uyeno the main street is 90 feet wide, exclusive of sidewalks. The outside width of the underground tunnel will be 27 feet, so that it can easily be built under less than half the width of the street above. So owners of buildings on the surface above the underground line need entertain no anxieties about the foundations of their property. Only at the stations will the line be crowded out under the space occupied by the surface tram lines. Tokyo is not overly well equipped with pavements and light and power wire carrying poles, so the company will be put to little expense for tearing up and replacing expensive improvements. When the underground is completed all the gas, and water mains, and sewer lines will be buried again in a conduit which will hold them all.

Cost of the Underground

If there are no unexpected engineering difficulties encountered in constructing the Tokyo underground, and if the soil is no different from that revealed by the tests already made, estimates of the outside cost of the first line between Shinagawa and Asakusa to Senju are Y.4,000,000 a mile. Four million yen a mile will cover the cost of the tunnel, all railway equipment, passenger stations, power transmission stations, automatic safety devices, in fact everything of the very latest efficiency to ensure the successful operation of such a railroad. The Tokyo municipal bureau of construction and the municipal railway bureau are agreed that Y.4,000,000 a mile will cover all the necessary expenses of construction and equipment. If Y.4,000,000 is the maximum cost per mile, then the nine miles and forty chains which are planned between Shinagawa and Asakusa will require Y.38,000,000. The Tokyo Chika K.K. directors estimate that the actual cost of putting the line in operation will actually be about Y.3,000,000 less than this. But any difference in estimates makes no particular difference to-day, the whole question now is, Will the road prove profitable?

It will require at least Y.4,000,000 capital paid up in full to put the underground in operation. Assuming interest or dividends at 8 per cent. a year, the company must earn Y.3,200,000 net profit annually in order to interest capital in its shares. Certain sums must also be set aside annually for depreciation and maintenance of equipment, and there are also the usual reserves, bonuses and the dividend equalization fund, so important for all Japanese industrial enterprises. Including all these funds the company must earn at least 12 or 13 per cent. a year net, about Y.5,200,000.

There will naturally be two sources of revenue, passenger and freight traffic. But although freight traffic should be extensive, it is not calculated on to yield one sen of revenue in the estimates which the promoters have made of probable earnings. The Tokyo municipal railway's lines from Shinagawa to Uyeno and to Asakusa, and then on to Kurumazaka, and Senju-Ohashi (see map), are to be followed, more or less, by the Chika Tetsudo tube, and the income for these lines on the surface is publicly known, so that it will serve for making an estimate of the probable passenger traffic and income of the underground.

Assuming that the income of the underground will reach a third of that of the surface lines, that third would be at least Y.6,673,000 a year.

On September 1, 1916, there were 42 stations on the municipal surface lines between Shinagawa and Asakusa, and that day 334,300 passengers were carried between the two terminals, while all the lines in the city carried 908,848 passengers the same day. From these figures it can be seen that 36.8 per cent. of all the passengers carried in that city that day rode between Shinagawa and Asakusa.

Between September 1, 1920, and August 31, 1921, the whole number of passengers riding on the municipal surface lines was 424,050,844. If we assume the percentage shown in 1916 for the traffic on the Shinagawa-Asakusa line still to be good, in the 1920-1921 fiscal year between the terminals alone, 156,050,710 passengers were carried. The increase in passenger traffic is about 10 per cent. a year, and on the basis of the figures given it becomes possible to estimate that in 1921-1922 fiscal year, 171,655,781 persons, in 1922-23 fiscal year, 188,821,395 persons, and in 1923-1923 fiscal year, 207,703,495 persons will travel on this important main line through Tokyo's busy streets.

If in 1923-24 one-third of these passengers should ride in the underground 69,234,498 fares will be paid. The tube will be opened in 1924, so we need not consider passenger conditions before that year in any estimate of the income of the Tokyo Chika Tetsudo. Consequently it is not a far stretch of the possibilities to estimate that the Shinagawa-Asakusa underground railway line will carry at least 69,200 passengers in the first year of operations.

Fares paid have been estimated at an average of 9.6 sen per person. The basis of the estimate is the ideal of charging the same fare for a long or a short ride. If a special charge is made for long rides, then perhaps 8 sen will be charged for the short ride. But this will make little difference in the estimates of total income. There is some talk of dividing the line into zones, but this would be a great mistake. The real utility of the underground line will be for long rides, not for short ones, and if it is efficiently operated it should absorb all the long-distance traffic now crowding the surface lines. Therefore the distance between stations will not be too short.

The lowest fare charged will probably be ten sen for a ride of half the distance. Full fare for the whole line will be 20 sen. If the line is divided into fare zones, it will probably not increase income. If a different charge is made for the long and the short hauls, it is very difficult to estimate income. But if income is estimated at a uniform fare of ten sen for all rides, then total income for the first year will be Y.6,920,000. This is Y.240,000 more than the company's estimate, and actually the result will probably be even better than this estimate. The line from Kurumazaka to Senju is not included in this estimate.

The Tokyo Chika Tetsudo Co. estimates annual cost of operation and upkeep at Y.1,536,000. Of this amount Y.273,750 represents power cost, based on a consumption of 25,000 kilowatts a day, at 3 sen a kilowatt. Other traffic expenses are estimated at Y.297,660: Office expenses, etc., at Y.149,000. Other operating costs:—

Carriage upkeep	Y.61,000
Track upkeep	20,000
Wire upkeep	8,500
Building repairs	15,000
Taxes	55,000
Operation of transformer stations	11,500
Miscellaneous expenses	15,000

The cost of power will, of course, vary with the number of trains operated, and the number of passengers carried. All other expenses, if compared to those of other companies, show that they have been adequately provided for.

The estimates for carriage and track upkeep at Y.90,000 may seem insufficient, but if the total expenditure is raised from Y.1,530,000 to Y.1,560,000 a year a discrepancy if any can easily be met. If income is Y.6,940,000, and expenses Y.1,560,000, net profits will be Y.5,400,000. It has been estimated that from Y.4,800,000 to Y.5,200,000 will be needed to pay a dividend of 8 to 9 per cent., but it can be seen the figures given here provide for Y.200,000 to Y.6,000 in excess of the needs of the company. If expenses are increased Y.100,000 a year over the company's estimates this will still leave a net income of Y.5,320,000. If this turns out to be the case the ratio of profit to paid-up capital will be 13.3 per cent., and an eight per cent. dividend will be easy to pay. All estimates have been prepared so that in actual practice there can be some contraction if necessary, and this makes the promoter's estimates more worthy of confidence.

It is conceded that an estimate that passengers will be only one-third of the number now carried on the surface line is too low. Experience abroad with undergrounds has been that the underground carries from 2½ to 14 times the number of passengers riding on the surface lines. Assuming the number of passengers in the Tokyo underground in 1926 to be one-half as great as the number using the surface line, the result would be (leaving out of all calculations the Kurumazaka-Senju line), 103,851,500 passengers. Paying 10 sen fares the total income of the company would be Y.10,385,000. If profits are figured to increase Y.2,000,000 in the same year, and paid-up capital is Y.40,000,000, then net profits would be about 20 per cent. If passengers reach the numbers estimated the cost of Y.4,000,000 a mile will be very little compared to the results that will be financially achieved.

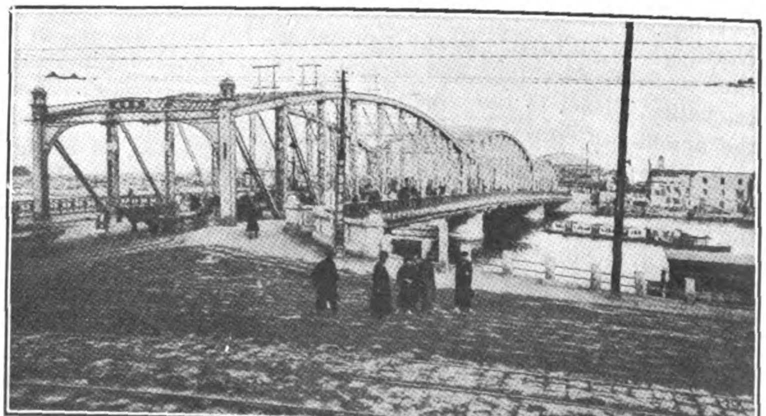
The average city tram fare is 6.88 sen. If the underground carries only 103,000,000 passengers at this fare, its earnings would be Y.7,155,000, and net profits Y.5,150,000, a profit rate of 12.8 per cent. All the shareholders expect is an 8 per cent. dividend, and there will be no difficulty whatever in earning enough and more than enough to pay it.

The Tokyo Chika Tetsudo Kabushiki Kaisha was organized at the time of the business boom with an authorized capital of Y.40,000,000. The panic caused the promoters to decrease this to Y.10,000,000, but only Y.1,000,000 was ever paid up. With this money the preliminary surveys were undertaken, and now that they have proved so successful the balance will soon be called up.

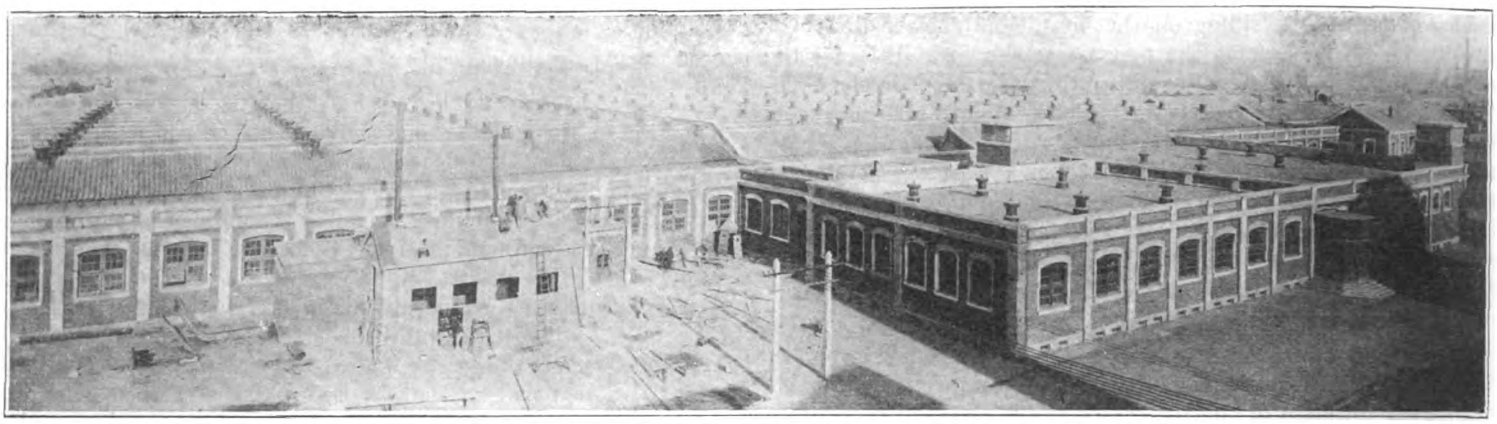
It should not be difficult to raise the balance of the Y.30,000,000 needed. But if this proves impossible in Japan, foreign investors will be asked to co-operate with the Japanese promoters. It is conceded that Japanese investment conservatism is doing a great deal to retard the building of the underground, financiers having no experience in such enterprises to guide them, and consequently they doubt all the estimates, and the feasibility of the project.

It is said that American financiers are looking over the field, and that they are much impressed with the findings of the Tokyo Chika surveys. Furthermore it has recently been reported from London that British financiers will co-operate with the group which has been licensed under the name of the Musashi Denki Tetsudo under the leadership of Baron Goh. But as this concern has not made one step to investigate the soil along its proposed route, the Tokyo Chika Tetsudo is the first in the field.

The complete geological survey was completed in September 1921, and ever since the plans for construction have been in preparation. It is now reported that actual construction will be begin in February or March of this year. The other companies have not yet got beyond the stage of plans to do something later.



Ryogokubashi Bridge, Tokyo



A Modern Textile Plant in North China; The New Heng Yuen Textile Company's Mill at Tientsin, equipped throughout with American Machinery

North China Cotton Industry

THE rapid development of the Chinese cotton industry during the last two decades has caused surprise in China and other countries. During or before the so-called "Boxer Rebellion," in 1900, the cotton spinning industry was not understood by the people in North China, and cotton growing was known only to a very limited number, says Mr. Ben Y. Lee, of Tientsin, in the *Textile Mercury*. But to-day millions of pounds of cotton are being produced annually and millions of *mows* of land are under cotton cultivation. Tientsin is the great cotton mill and cotton distributing centre in the north of China, and ranks second in China, next to Shanghai, as a great cotton manufacturing centre and is a new field for this industry. If conditions remain favorable as at the present time, in a few years to come this city will have a half million spindles and thousands of looms. The business opportunities of the city are based on the fact that it is the outlet for a vast hinterland consisting of the richest provinces of North China, and extending into Mongolia. Its good communications by land, rail and water have made it a distributing centre for a constantly growing volume of imports and exports. It is the great distributing point in the north of foreign goods as well as a collecting depôt for goods to be shipped abroad. Animal products and cotton form its chief exports.

Almost all cotton grown in the north provinces is being shipped to Tientsin. Some is being exported to Japan, where it is used for stuffing kimonos and other garments, and also to the United States, where it is mixed with wool in the manufacturing of blankets. Owing to the fact that it is well adapted to the latter purpose, the United States is one of the best purchasers of this grade of cotton. Cotton cultivation, on the whole, has not been so successful in North China as in the Yangtze provinces, because the season is shorter, frosts are earlier, and the soil is not so rich as that in Yangtze valley. Prior to 1900, there are no available statistics to show the amount of cotton in this region. In 1902, however, records show that there was more than 70,000-lb. exported to foreign countries, especially to Japan, and to other ports in China. During the last twenty years cotton exported from Tientsin has been grown enormously. Since 1910, the annual export from Tientsin has varied from 50 to 100 million lbs. Factors which have stimulated cotton production are the substitution of the cotton plant for the opium cultivation which had been prohibited by the government; the organizing of the Chinese millowners' association; the bureau for the improvement of the cotton industries; and organizations for promoting the industry in various places by establishing many cotton experimental stations; a better demand from abroad, especially from Japan; the successful efforts of the dealers to stop the practice of watering the cotton; and lastly the high price of cotton during the past few years.

The following table gives the amount of cotton grown and the amount of land used for cultivation of cotton in the northern provinces and also others. In the northern provinces are included Chihli, Shantung, Shansi, Shensi and Honan. The word "*mow*" in Chinese means about one-sixth of an acre, and *picul* about 133-lb. :—

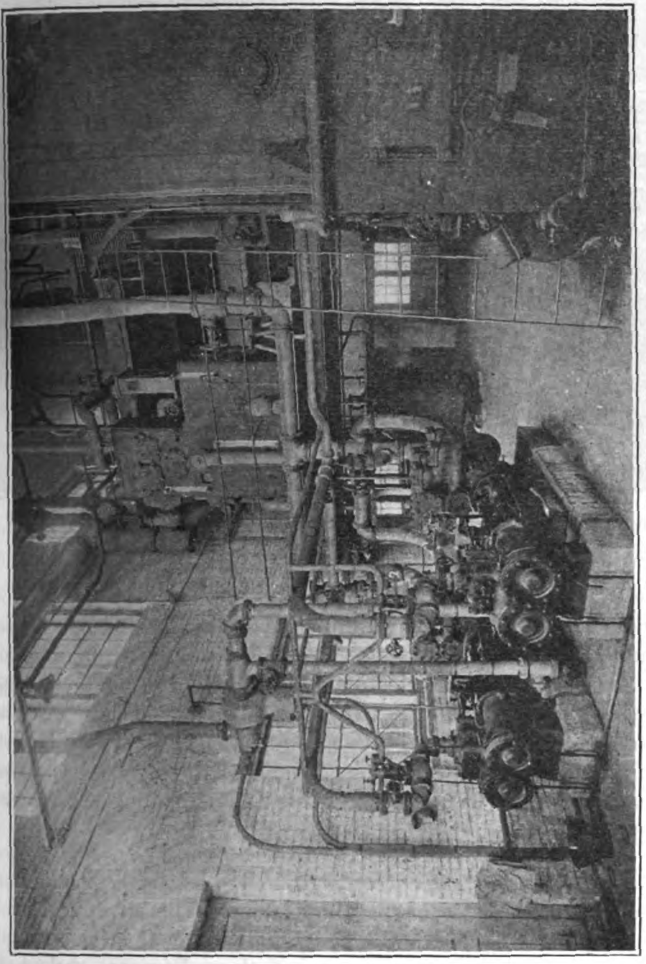
	1918. Piculs.	1919. Piculs.	1919. Mows.
Chili	2,099,381	4,794,083	6,104,349
Shantung	720,787	3,429,610	3,873,500
Shansi	304,322	99,370	490,000
Shensi	680,000	720,000	—
Honan	268,161	2,746,620	2,531,600
Hupeh	2,370,000	4,300,000	3,971,342
Kiangsu..	3,368,500	4,128,500	8,890,000
Chekiang	724,000	743,000	1,638,000
Hunan	—	78,150	73,420
Kiangsi	131,250	16,900	16,400
Szechuan	—	—	—
Anhwei	243,000	125,530	—
Total	10,022,700	19,577,000	27,500,000

The foregoing table has been compiled and tabulated recently by the bureau for the improvement of the cotton industries, Tientsin. The statistics given by the Chinese millowners' association, Shanghai, in regard to the production in 1919, is 4 million bales of 500-lb. each. The difference is due chiefly to the incorrect reports and incomplete investigations of both associations and also the inaccessibility of certain parts of the country. Cotton grown in many localities is being consumed locally, hence absolute accuracy is almost impossible. It will readily be seen that Chili province, in which Tientsin is located, is becoming a great cotton-producing centre. The following table gives the percentage of cotton grown in various provinces, and the numbers are for the reference to the chart :—

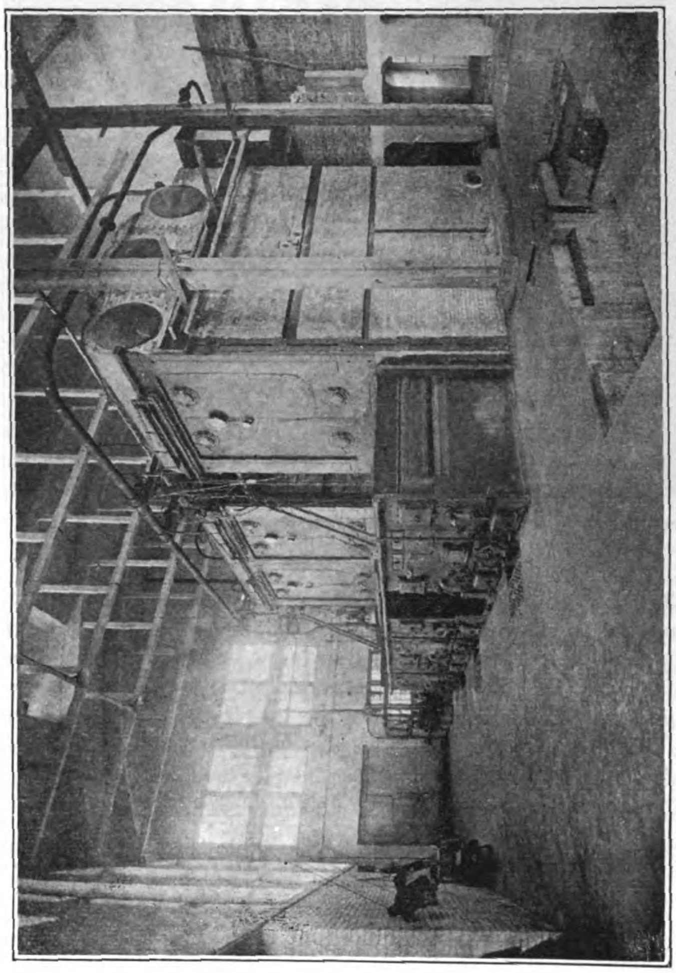
	1918.	1919.		1918.	1919.
Kiangsu ..	35.70	21.00	Honan ..	2.63	14
Hupeh ..	20.41	21.60	Anhwei ..	2.10	0.6
Chili ..	18.15	23.00	Kiangsi ..	0.91	0.10
Shantung ..	6.23	17.00	Shensi ..	5.19	0.37
Shansi ..	2.32	0.5	Chekiang ..	6.26	3.80

The average length of fibres grown in the North is about 1-6th to 1-8th of an inch, and some are of nearly an inch. It can be spun

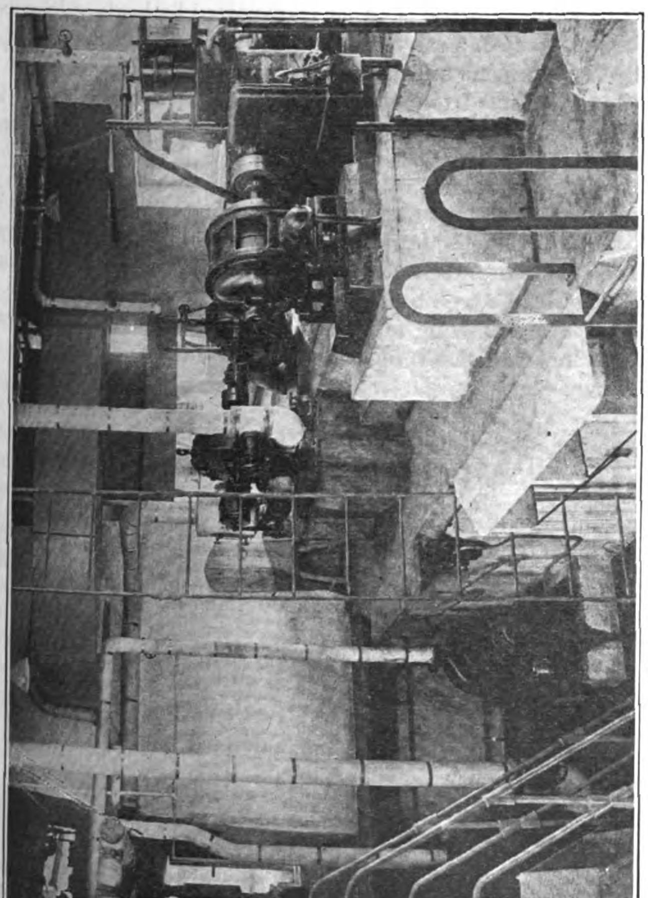
POWER EQUIPMENT IN THE HENG YUEN TEXTILE MILL AT TIENTSIN



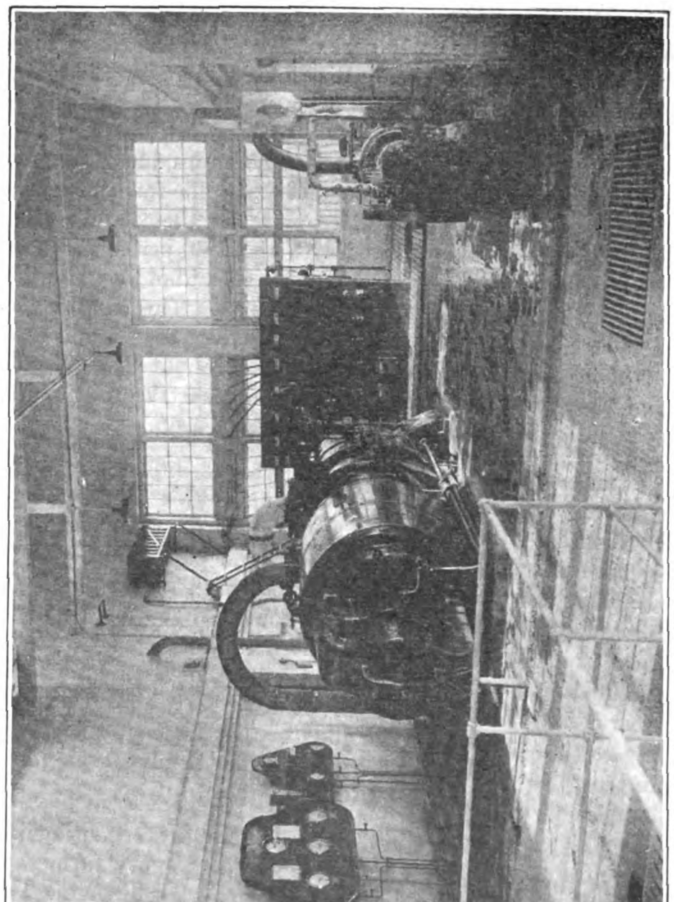
Boiler Room—Auxiliary Equipment



Boiler Room—To be enlarged to 5 B. & W. Stirling High Pressure Boilers with Murphy Stokers and Diamond Soot Blowers



Circulating Water and Hot Well Pumps



Turbine Room: 1·750 Kilowatt General Electric Curtis Turbine

Section Card Room, Saco Lowell Textile Machinery, American Moistening Co.'s Humidifier System

Spinning Room: General Electric Motors used throughout Mill

up to 36's. The staple most nearly resembles Peruvian cotton and is of fairly good color, but is wiry. The above is from native seeds. Many tons of American seed are now being distributed free to the farmers living in the neighborhood of the various government experimental stations. Almost all these stations have finally decided upon "Trice" as the best early variety of American cotton for extensive cultivation. Next to "Trice" is "Lone Star," then "Cook's Big Boll" and finally "Banker's Account."

Modern farm implements are not yet employed, because of the lack of modern improvements and the narrowness of the Chinese cotton field. The average field is less than half an acre in width. Man labor is employed chiefly on account of the low rate of wages. Little or no science is applied in the cultivation. The rotation adopted is somewhat irregular.

Planting begins in the early part of May. Seeds are scattered all over the field instead of being distributed in rows. Thinning usually takes place about a month after seeding. Picking begins in October until before the frosts. Two kinds of fertilisers are used. The one which is used extensively is the "home product," and the other is the cotton seed cake and bean cakes. The former may be applied to the soil either before or after, or during the cotton season. It consists of human excreta diluted with about 50 per cent. water. It is distributed over the fields by hand with the aid of long handled ladle, and is spread over the surface of the soil. This kind of fertiliser may be purchased at very cheap prices. The cotton seed cake and bean cake are broken into pieces about half-an-inch square and then are put into the cotton bed near the root of the cotton by hand at about one-quarter of an inch deep.

The exact cost a *mow* of producing cotton is difficult to ascertain, for nearly all the cotton growers cultivate a few *mows* of land by themselves without hiring any help. Some farmers managing large farms generally hire help, and pay from 30 to 70 dollars per year, with food and shelter free; while others pay from 4 to 10 dollars for picking for one season only. Each *mow* of land can produce from 60 to 150-lb. of seed cotton, of which 30 to 35 per cent. is lint cotton. The price of lint cotton in this region since the new year is from 21 to 23 taels per picul. Nearly all the growers do not buy seeds; they select the good quality from year to year. On account of lack of intelligence and technical education, most farmers cannot manage farming on a large scale.

The cotton gins employed are similar in appearance, principle and operation to the "Macarthy" gins. Nearly every farmer of some means owns one, and gins his cotton before selling it. The weight of these ginning machines is from 70 to 100-lb., and they are manufactured both in Japan and in China. They can either be moved by steam or man power. The total amount of cotton produced by one of these machines in a working day of eleven hours is from 150 to 200-lb. The seed cotton is fed by hand to the table in the front of the machine, and, falling into the hopper, is brought into contact with the revolving roller. After being passed through many mechanical devices, the ginned cotton is stripped from the roller by the stripping beard. It falls to the ground in a continuous fleece, and is kept from mixing with the seeds by a sheet iron division plate.

After ginning, the cotton is packed in bags either made of coarse grey cloth or made of bamboo strips. The sizes of these bars vary, some being 84 to 46 inches, some 72 by 42 inches, and others 48 by 36 inches. The weights of these bags are various, from 300 to 100-lb. Cotton is either transported by boats or by railway; the transportation cost varies from 60 cents to one dollar per picul. Many foreign firms and their representatives to the interior to buy small quantities from individual farmers, and then ship large quantities at a time by special boats. A Japanese firm named Mitsui & Co. is doing a large business of this kind.

The increase in the number of spinning mills in these provinces has been developed in proportion with that of cotton growing. Before 1914 there was not a single cotton spinning mill in the north, but now there are more than a dozen scattered over these provinces. The following table gives the number of mills in Tientsin and its neighborhood including those under construction and planning :—

Name of Mill	Year est.	No. of spindles	Maker	No. of looms
Heng Yuen (old unit)	1914	5,000	H. & B. English	
Heng Yuen (new unit)	1920	20,000	Saco Lowell	300 (C. & K.)
Yu Yuen ..	..1918/21	70,000	Saco Lowell	500 (C. & K.)
Wash Sing No. 1 ..	1918	20,000	Saco Lowell	
Yu Ta (under construction) ..		35,000	Saco Lowell	
Pao Cheng No. 3 (under construction)		50,000	Saco Lowell	
Pei Yang No. 1 ..	1921	25,000	Saco Lowell	
Wei Yu (Proposed)..		20,000	Saco Lowell	
Model Mill (under construction) ..		10,000	Fales & Jenks	

It is reported that Japanese capitalists have proposed three mills of from 20,000 to 30,000 spindles each to be located at Tientsin, but so far none of them have been materialized.

The following table gives the number of mills in other northern provinces:—

Mukden Mill (under construction) ..		10,000	Saco Lowell	300 (C. & K.)
Lu Foong, Mukden Tsinan, Shantung	1918	15,000	H. &. B. English	
Wah Sing No. 2 Tsinan, Shantung	1920	15,000	Within	
Wah Sing No. 3 Tangshan, Chili		12,000	Hetherington	

There are also several proposed new mills ranging from 10,000 to 15,000 spindles, to be located in Shensi and Honan provinces. The makers of the machinery are both British and American. It is also reported that there are many Japanese mills to be operated in Tsingtao, Shantung.

Nearly every cotton mill in the North, under Chinese management, especially those in Tientsin, is or has been financed and promoted by high or ex-officials. In many Tientsin mills the big shareholders are not well known in public. Pei Yang, a mill in Tientsin, is the only exception to the general rule, that is financed entirely by the Chinese yarn dealers in the city. The wages and salaries paid in all the mills in the North are about 10 per cent. higher than those in Shanghai and elsewhere.

The Yu Yuan Textile Company of Tientsin is the most prosperous. The mill was organized and constructed in 1917, and was under operation in 1918 with 25,000 spindles. The promotors are high officials, and the mill has been financed by a few men. During the last three years enormous profit has been made, and with this the second extension of 25,000 spindles was made in 1920, and a third extension of 20,000 more spindles and 500 looms will be made in 1921. Thus with a total of 70,000 spindles and 500 looms, it becomes the largest mill under the same management in the North, and one of the largest Chinese mills in the empire. Among the factors that have contributed to its success are honesty and efficiency on the part of the manager, together with good systems of bookkeeping, recording of production, and laborers, etc. The mill employs practically all young men, called apprentices, from 12 years old and upwards, with a few women operatives. Lodging and food are provided free to the apprentices' and mechanics' families. The tenement rooms are built of one story near the mill for all operatives. The daily production per spindle for 16's yarn for so-called 24 hours is over 1-lb., and for 10's nearly 2-lb. On the average the percentage is from 5 to 10 higher than other Chinese mills. The breaking strength of 16's yarns is nearly 90, and of 10's is over 110-lb. These two things have made the mill successful in the manufacturing end. Roving, draw frame and spinning frame operatives are paid by hanks. In average Chinese mills there are about 650 employees per 10,000 spindles for both day and night shifts, but this mill employs 5 to 10 per cent. less. In other mills many small children, not tall enough to reach the front roll of spinning frames, are employed; in this mill not a single person under 12 years of age are employed. Dining halls are provided for operatives outside the mill proper. Such things are rarely seen elsewhere in China.

The manager being instilled with modern education is doing much philanthropic work for his employees. The welfare features for the employees have been developed. Pool room, mill school, lecturing system, reading room, library, etc., are provided. Such a spirit is rarely found in Chinese mills. Nearly every operative has been receiving a bonus twice a year of from 10 to 150 dollars each. Every salaried man has been receiving more than 200 per cent. bonus monthly besides some "extra" during the past years. The manager himself has been receiving, including salary and bonus, more than the president of the United States receives annually. The shareholders have been receiving over 30 per cent. dividends besides the additional shares for the new additions. Perhaps within a few years the mill will become the largest one in China.

The question of supply and demand of cotton for local consumption in the north is important as well as interesting. Taken as a whole, China has up to the present time about 2,000,000 spindles, more than 1,500,000 of which are located in Shanghai or in its neighborhood. In the northern provinces there are about 300,000 spindles, including those under construction and proposed, or, in other words, there are about 15 per cent. of the total spindles located in the north. Yet the northern provinces produced last year a little over 50 per cent. of the cotton grown in China, and it is expected a greater percentage will be produced in consecutive years. One great and distinct advantage that the northern mills have is the abundant and ample supply of raw cotton. At the present time the larger part of the cotton grown in the north is being exported to Shanghai or to foreign countries. On the average each spindle consumes about two and a half piculs per annum, then 300,000 spindles would consume at the most 750,000 piculs per annum. It is clearly seen that the question of shortage of supply of cotton for the northern mills does not enter into any serious consideration. The high price of cotton yarn and raw cotton during the year 1920 up to the present time, which materially aided in the rapid development of the cotton mill industry in China, rhould also be taken into consideration. The prices of these had seached their highest points in the early part of 1920, and has been generally falling since. The price of cotton from its highest to its lowest is about 10 taels or about 14 dollars per picul. It takes about 3½ piculs to make a bale of yarn, thus making about 35 taels difference in the cost of raw cotton at the two different periods. Adding the difference in the cost of raw cotton to the low price of yarn, it is evident that the actual profit made per bale by cotton mills differs but slightly from that of 1920. The following figures show the price of yarn and raw cotton in each month during the mentioned months. The Tungchow cotton and 16's yarn from a Chinese mill in Shanghai are taken as the standards:—

	YARN. Taels per bale of 400-lb.		RAW COTTON. Taels per picul.	
	highest.	lowest.	highest.	lowest.
January ..	195	190	33.25	32.50
February ..	208	198	33.50	33.25
March ..	209	202	34.25	32.75
April ..	201	188	33.95	33.00
May ..	188	168	33.50	32.25
June ..	192	172	32.00	31.00
July ..	178.50	165	34.00	33.00
August ..	173.60	162.20	32.00	28.50
September..	164.50	150	30.00	28.50
October ..	155	148	28.50	24.50
November..	157	137	25.50	24.00
December ..	139	131	24.00	22.00

From January to April of this year the price of cotton remained practically stationary, that is from 22 to 24 taels per picul, while the price of 16's yarn fluctuated from 132 to 140 taels per bale. The causes of the decline are many, but the chief ones are the industrial depression in Japan, which caused a dull yarn market in that country and in turn affected the Chinese yarn market, the decline in the price of American cotton, and the increase in the number of spindles in China since last year.

Very few mills are equipped with English machinery. There are many British firms in Tientsin who are agents for British textile machinery, but they are doing very little business because they cannot give definite delivery dates. Textile machinery makers, as well as those who are interested in textiles in general, should bear this condition of delivery in mind. This is a new field, and with certainty the demand for both manufactured goods and machinery will be enormous as time goes on.

The New Canton

By Orrin Keith

THE metropolis of South China is rapidly growing away from its ancient reputation for narrow streets and overcrowded houses. There are still many of both but the new-comer now receives his first impression of broad avenues and modern, and in some cases really excellent, buildings. So rapidly is the change taking place that even those who leave the city for a stay of two or three months return and exclaim at the transformation.

The scheme of tearing down the old city wall and replacing it with boulevards was first broached in 1911 by T. T. Ching, a returned student, and then commissioner of public works in the days immediately following the revolution. Nothing came of the matter at that time, however, and the troublous years which followed allowed no opportunity for such improvements. Not until the end of 1919 was the plan revived. Then Ngai Pong-ping, commissioner of police under the Kwangsi government of Mo Wing-sun, tore down the city wall and began constructive work under Ching's plan. This government completed the paving of 37,000-ft. of highway.

That the end in view was something more than the modernization of Canton there is considerable evidence. Mo, or Mok as he is known locally, organized a syndicate among his friends and they bought up the property on both sides of the proposed roads. This property had an average value of perhaps $200 per *chien*. Mok, however, was military governor of the province, and, moreover, he belonged to the old school of officialdom. He decreed that this property was worth $5 per *chien* and forced the transfer of the title to his syndicate at this price. Even this was not paid too often and when the Kwangsi militarists and their henchmen were ejected at the end of 1920, they left creditors to the extent of $1,500,000 clamoring for the pittance they had been allowed for their land.

Another transaction of interest was the acquisition of the lands of the bannermen. Up in the north-west corner of the city were several hundred acres which, because of the distance from the gates, were so inaccessible as to be of comparatively little value. With the walls down, however, these would face a boulevard and be immediately opposite a very crowded portion of the extramural city. Their value would therefore be greatly enhanced. The syndicate tried to persuade the bannermen to turn these lands over to them on the agreement that the syndicate would assume the obligation to pay them as long as they lived the same income they had formerly received. Even a bannerman could see some doubtful points in such a scheme. So the syndicate changed its tactics and offered to buy the property at a price which would yield the same income. This sounded more reasonable. The money was to be deposited in the government bank. The deeds were to be turned over to the syndicate. Then the bannermen were to get their money. All went according to program until the last step was reached. When the bannermen called for their money after delivering their deeds, the bank was very sorry, but the government had requisitioned that money for other purposes!

If the beginning of Canton's transformation was closely associated with the sordid methods of the old mandarinate, the later developments make cleaner reading. At the end of 1920 the Canton municipality was formed. It fell heir to the work of city improvement, although it could make no effective claim to the $10,000,000 its predecessors are alleged to have made out of the project up to that time.

The new men at the helm seem to be of an entirely different mold. They have taken up and even extended the plans for municipal development but have so far kept themselves clear of all charges of graft or extortion. They have even paid a portion of the indebtedness which the old gang left and are making arrangements to pay the remainder. The entire system of acquiring the necessary lands and properties has been remodelled. Instead of the syndicate system and its corollary of private and official graft, they have instituted the American system of condemnation and assessment. The owners of properties taken are to receive due compensation and the owners of properties benefitted are to pay the cost of the improvement.

The most important development under the new plan is the continuation of the bund from its present termination opposite the east end of Shameen westward along the Shameen canal to the western end of the city. The present road is twenty feet wide. The new bund is to be eighty feet. The city commission has placed a value on the property which it is necessary to take for this purpose at an average of $250 per *chien*. If any property holder is dissatisfied with the amount allowed him for his property, he may ask for arbitration. The board of arbitration will consist of two members of the commission, one member appointed by the property owner, one member appointed by the chamber of commerce, and the provincial recorder of deeds. Their decision will be final. It may be contended that the property owner has but little representation on this board. The decision, however, has passed from those who place their own profit above all scruple, to a disinterested majority at least. This is a favor, and not a small one, for which the property owner ought to be, and is, duly thankful.

The property acquired and the street constructed, the next step is to apportiôn the cost among the holders of property fronting on the new bund. It is estimated that such property will be worth at least $325 per *chien*, though this is considered a very low estimate. The former value of each piece will then be assessed by the department of public works and the owner required to pay the difference between such assessment and $325. He has the same right of appeal to a board of arbitration as is provided in the case of the condemned property.

The plan in general is to put through these improvements in such a manner that the properties benefitted will just pay the actual cost. Neither the city nor any individual is expected to make anything. It requires considerable courage to really believe that nobody will make anything in such a series of transactions. And yet the present city government has kept itself remarkably free from even the suspicion of private profit.

The average width of the main avenues at the present time is about eight feet. It is intended to widen all the avenues to at least twenty feet. This is not to be done according to any fixed plan of reconstruction but as different parts of the city are destroyed by fire, the property owners will be required to rebuild under new regulations. This plan too is in part a heritage from the old *regime*—but with a difference. Under the old government, when a district burned, the house-owners were required to build back to a new line. The exact location of this line, however, was carefully concealed. In fact, it was not fixed at all. The amount the owner had to go back from the old line therefore depended largely on how much squeeze he paid to the officials in charge. Under the new administration, whenever a street is burned, the entire street is surveyed and the ultimate lines are fixed and published. There is no favor and no graft. It is estimated that the entire city will be rebuilt under this "fire-and-reconstruction" method in about twenty years.

Meanwhile another improvement is receiving the attention of the department of public works. Parks or public gardens are not usually associated with Chinese cities. But the new Canton is to have these in adequate measure. Already there is one in the centre of the city which has been handsomely beautified after the Occidental fashion. Its area is about 7,000 *chien*. To the north of this, running up to the old north wall of the city, is the hill of the goddess of mercy. This is beautifully wooded and requires little in the way of artificial treatment to make it a delightful park. Heretofore it has been largely shut off by the location of various yamêns and other public properties so that its beauties have been accessible only to the favored few. Now it is planned to open it up by running the necessary boulevards and convert it into a public park.

A third plan calls for an extensive public playground in the eastern part of the city. This will have a large athletic field, track, ball-grounds, etc. Here the new China may disport itself after the manner of the young men—and young women—of the West. The fourth project is for a small park on the island just east of the end of the bund. The bund will be carried across the canal and the canal itself filled. This will be largely a show place as a terminus for the bund.

Even more ambitious is another project of the new administration. Canton makes no effort to hide under a bushel its light as the "livest" city in China. But if numbers are to be taken into account, it is a city of the dead. A survey recently completed gives the estimated number of graves within the present city limits as over 18,000,000! Eighteen million ancestors sharing Canton's supersaturated area with a million and a half of their living descendants!

The extent of this supersaturation is apparent from another survey. Canton has only 120,000 buildings. Of these 30,000 are stores, godowns and other business structures. The result of the survey is an estimate that, in spite of the number of people who have taken to boats—over 50,000 in the city itself—there is an average of twelve to fifteen persons in every dwelling house in Canton! As a great many have only five or six, there are also many which run as high as twenty or thirty!

A really pressing problem then, is some provision for new dwellings. And the proposal to extend the city in any direction meets with immediate objection from some of the eighteen million ancestors! This objection was conclusive in former times. But the new governors of Canton have decreed that if the necessity for homes for the living conflicts with the rights of the dead, then the dead must move! And the migration has already begun. A tract of some 48,000 *chien* on the outskirts has been declared suitable for building purposes. The city has begun the work of exhuming the coffins. In one small corner of it during the month of November they found 20,000 coffins. These are exposed for identification and when identified are turned over to the relatives together with a payment of $3 to $10 to pay for reburial elsewhere. As fast as the graves are removed the property will be sold for homesites.

The money obtained from this development will be used to commence the construction of Canton's sewer system. There is a temporary sewer along the line of the old moat before the city wall and the new boulevards are provided with sewers, but no general arrangement has been made as yet. The need for such a system it is not necessary to dwell upon.

Among the lesser enterprises of the public works department are five public slaughter-houses and two public markets. Much of the disease of the city has been rightly or wrongly attributed to the practice of the private killing of animals and the exposure of the meat for sale uncovered in open stalls along the dirty streets. In time all animals will be slaughtered in the public slaughter-houses under sanitary inspection and the sanitary requirements for the sale of meat will be much more stringent.

One more plan of the new government, even though it is still in the making, is of interest. There are in Canton a number of old yamêns, and other government properties with extensive grounds. The land is extremely valuable but the buildings are in few cases suited to the present needs. It is proposed to sell all of these properties. This would serve the double purpose of giving more area for home building and bringing in to the city treasury a large sum of money. This money it is proposed to use in the construction of a civic centre with modern buildings to replace the present yamens. The site at present favored is on the island of Honam, across the river from the old city of Canton and not far from the Canton Christian College.

Such are the plans. They are ambitious. Not so long ago they would have been laughed at as vain dreamings. But to-day so many of them have been actually realized, and the way seems so clear for the rest of them, that they can no longer be laughed at. Canton is apparently determined to be a modern city. And Canton is rapidly becoming one.

New Amoy Telephone System

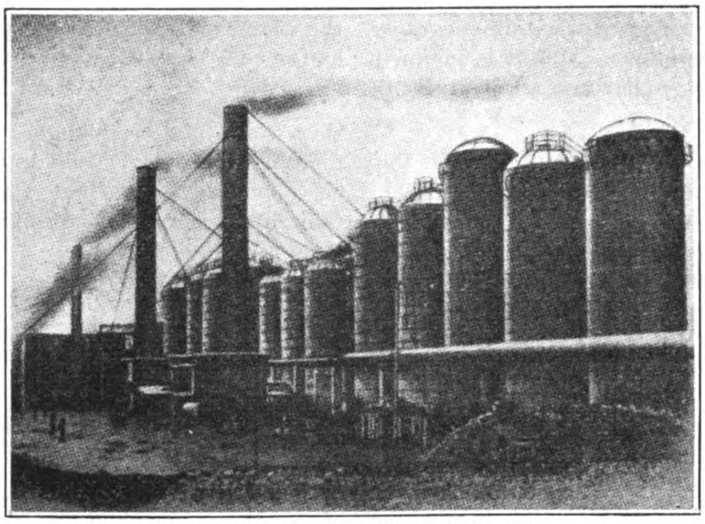
THE Kellogg Switchboard and Supply Company have just signed a contract for the installation of a complete new telephone installation for Amoy, which calls for a 1,500 line common battery system, with 1,000 wire miles of copper cables. Submarine cables for ten simultaneous connections will connect the island of Amoy with the Foreign Settlement of Kulangsu Island. The contract also includes poles, cross arms, insulators, and all pole line hardware. No part of the old system will be used in the new installation.

Mr. Oei Tjoe

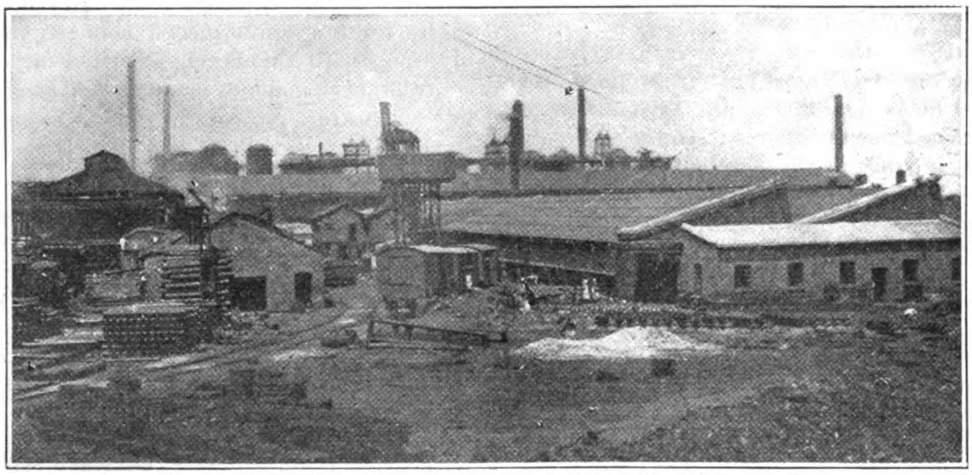
The new enterprise is due to the civic patriotism of Mr. Oei Tjoe (I. Joe Hwang) a Chinese multi-millionaire whose signature is said to be good for 5,000,000 pounds sterling. A native of Amoy, he drifted to Java and entered the business of coolie contracting for the sugar estates and other enterprises, and in course of time invested his earnings in sugar properties. The wave of war-time prosperity carried him into the millionaire class. He is credited with founding the China and South Sea Bank, Ltd. in which he is the largest stockholder. Returning to Amoy to enjoy the remaining years of his life in his ancestral home, he determined to contribute something to the welfare of his city. The extremely poor service of the local telephone system provided him with this opportunity and the outcome is the contract with the Kellogg Switchboard and Supply Company for a complete new plant.

ASIATIC STEEL WORKS.—1. The Bengal Iron Works

THE Bengal Iron Co., Ltd. was registered in December, 1919, with an authorized capital of £2,500,000 to acquire the Bengal Iron & Steel Co., Ltd. The works are situated at Kulti in Bengal on the East Indian Railway, 142 miles from Calcutta. It has already been shown how the latter company, founded in 1889, was the lineal descendant of the Barakar Iron Works Co., Ltd., which was started in 1875. In 1889 the plant consisted of two small open-top furnaces, only one of which was worked, for which the blast was heated by coal in pipe stoves, and one blowing engine with its complement of boilers which were entirely fired by coal. The production of pig iron in 1889-90 was about 9,000 tons per annum, and was disposed of to government establishments either in that form or in the shape of castings. The foundries then covered an area of 12,300 sq. ft., and the production from them was 3,800 tons per annum. At that time the company did not own its own collieries, but purchased its coal and coke requirements in the open market. The site of the works was chosen originally on account of the close proximity of both coal and iron ore supplies, and for many years the clay ironstone nodules that formed the ores for the furnaces were obtained from a geological horizon in the Gondwanas, known as the Ironstone Shales. This crops out between the coal-bearing Barakar and Raniganj stages, and stretches for some distance east and west of the works. The iron ore was obtained by contract with the local proprietors of bullock carts, and the supply was uncertain in quantity and variable in quality.

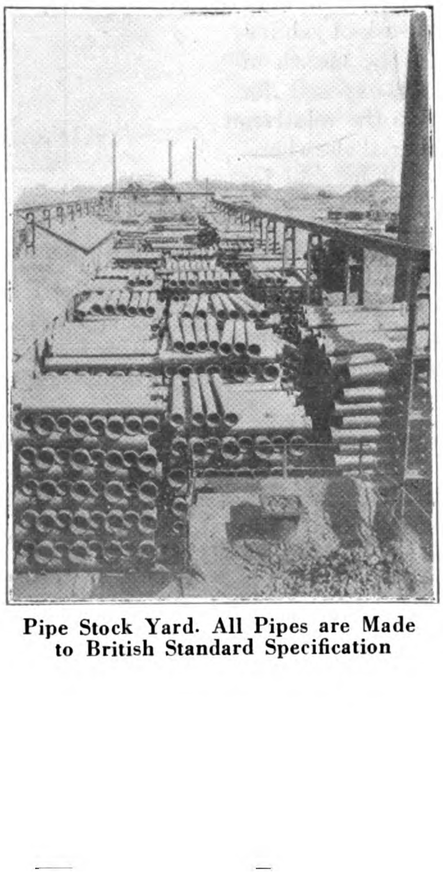


Bengal Iron Works: View of Furnaces



Back View of Bengal Iron Works, Showing Pipe Foundry

The remodelling of the works was taken in hand at once. The two original blast-furnaces were converted into close-top furnaces to enable the gas to be utilized for firing the boilers. At a later date, as they required rebuilding, they were removed and replaced by two modern furnaces. A new furnace was also erected, fitted with three 17-ft. diameter Cowper stoves. During the period up to 1914 steady progress was made; collieries were purchased and developed, namely, Noonodih, in the Jherria field, in 1905, and Ramnagar, 1½ miles distant from the works, and connected with them by a light railway, in 1907. By 1908 several small iron ore areas had been acquired, one of which was at Kalimati (now Jamshedpur), close to the site of the present Tata iron and steel works. With the opening up of the company's mines at Manharpur, in the Kolhan Estate of Singhbhum, in 1910, a constant supply of first-class hematite was assured, for already many millions of tons of high-grade material have been proved, and the use of the ore from the Ironstone Shales was finally discontinued. The outbreak of the war found three furnaces in operation with an annual output of approximately 80,000 tons of pig-iron, each furnace with its four Cowper hot-blast stoves, and the whole plant operated from a modern power-house containing three turbo-blowing engines of a total horse-power of over 4,000. The plant in existence today will now be described.



Pipe Stock Yard. All Pipes are Made to British Standard Specification

There are four furnaces in operation, a fifth under construction, and twenty stoves for heating the blast; seventeen of the latter are 65-ft. high by 21-ft. in diameter, and three are 55-ft. high by 17-ft. in diameter. On the completion of the fifth furnace the total capacity of the plant will be 175,000 tons of pig iron per annum. The blast is supplied from turbo-blowers of the Parsons type, with a total capacity of 115,000 cub. ft. of air per minute. There are twenty-four Lancashire boilers, fired by waste furnace gas, in two batteries, supplying steam to the blowing engines. The iron ore, coke and limestone are delivered from railway wagons and raised to the charging hoppers by two steam and electric hoists. In the case of No. 5 furnace, a Brown Hoisting Co.'s charging apparatus has been provided. The slag is removed in Dewhurst ladles and taken to the tip in a molten state.

The coking plant consists of three batteries each of thirty-four Simon Carves by-product ovens, with an out-turn capacity of 130,000 tons per annum, complete with recovery plant for coal tar and ammonia, and also sulphuric acid plant. A fourth battery is under construction which will raise the total output to 200,000 tons per annum. The present raisings of coal from the company's collieries (Khendwa

and Ramnagar in the Raniganj field and Noonodih in Jherria) are about 150,000 tons per annum, but are being increased to 250,000 tons. The requirements of the coking plant are drawn from these and other sources. The coal is discharged from railway wagons into hoppers, whence it is elevated to the crushing machines and thence to the storage bunkers. It is compressed before entering the ovens.

The waste heat from the ovens passes to a battery of boilers, where it is used in raising steam for the electric generating plant, which has a capacity of 2,500 kw. and provides power and light throughout the works, to the Ramnagar colliery, and to the pumping station at Monberia on the Barakar River.

The area occupied by the foundries has increased from 12,300 sq. ft. in 1890 to 175,000 sq. ft. to-day. This department comprises pipe foundries, railway sleeper and chair foundry, general casting foundry and brass foundry, together with pattern shops, etc. Pipes are made in dry sand moulds and vertically cast. One plant is fitted with hydraulic and the other with electric power. Flanged pipes of all sizes for steam or water mains are made. During the war the company supplied many miles of pipes for Mesopotamia and the north-west frontier, in addition to 20,000 tons of high-grade ferro-manganese made from Indian ore and dispatched to America, France and Italy. Large quantities of railway sleepers were also supplied for extensions in various military zones. The railway sleeper foundry is fitted with moulding machines for making both plate and bowl designs.

In the general foundry all kinds of castings up to 10 tons in weight are manufactured, including columns for buildings and mills, straining posts and sockets for fencing, mortar mills, road rollers and machinery castings, ornamental columns, lamp-posts, railings, etc. The foundries are capable of turning out 60,000 tons of castings per annum divided as follows: pipe 15,000 tons, sleepers and chairs 30,000 tons, general castings 15,000 tons.

The Bengal Iron Co., Ltd., to-day employs about 100 Europeans and 15,000 Indians, and every effort is made to cater for the physical well-being and comfort of both. A modern hospital administers free medical treatment. Foodstuffs are issued at cost price, while schools for boys and girls have been built and are principally financed by the company.

2. The Lungyen Steel Works

ONE of the most interesting and useful additions to industrial China is the 250-ton blast furnace plant of the Lungyen Mining Administration, now under construction at Shiechingshan, eleven miles west of Peking on the Mentakow branch of the Peking-Suiyuan Railway.

The site is an admirable one, there being ample room on the great flat plain for the very extensive future expansion contemplated, sufficient water supply and connections with two railways; the administration owning its own six-mile line making connection with the Peking-Hankow line at Loukowchow. The elevations chosen and the layout determined are such that the traffic about the plant will be conducted under ideal conditions, second to none anywhere. Ore, coke and limestone are received and go to the stock handling system or to the stock piles without crossing any other yard track at grade. Iron, slag and incoming materials have each their own separate lines. Traffic interference will be reduced to a minimum. The location of the present plant was formerly a low rock hill which has been leveled leaving the foundations of all structures in solid rock.

The plant was designed by Perin and Marshall, of New York, and the materials are all of American manufacture.

Mr. G. Gordon Green is engineer-in-charge of construction.

The furnace is of latest American design, 85 feet from hearth to charging platform, 13-foot hearth and 18-foot bosh. The eight columns are of built up structural steel and there are eight tuyeres offset from the columns to give maximum working space. The hearth jacket is of steel plate, lined with cast iron cooling plates. Two iron notches are provided, one above the other, to facilitate tapping when the furnace is working badly. Two cinder notches are also provided, at the same elevation and ninety degrees from each other, to give relief in case of accident to one of them. The tuyere and bosh jackets are of heavy steel plate with the usual type of bronze cooling boxes. An added ring of permanent cast iron cooling boxes is inserted in the brick lining above the mantle, near the bottom of the first ring of shell plates. The brick lining was made in America, the top fifteen feet being protected from the incoming charge by cast iron wearing plates laid in small units in the lining itself. The furnace top is a Marshall design with double skip hoist, distributing hopper and two bells enclosed in a gas tight housing. Four bleeder pipes extending 43 feet above the charging platform carry the poisonous gases well above all working levels. These four bleeder pipes also carry the bell lever, skip sheave and bleeder valve platforms. From them also, at a height of 15 feet above the charging platform, are taken the two downcomers, instead of from the shell itself, thus minimizing the amount of coarse material and heavy dust carried out by the gas. The gas passes from the downcomers through two 20-foot dustcatchers where the bulk of its dust is removed, thence through the gas mains to the stoves, where it is burned to heat the blast, and to the boilers.

The iron notch is closed by a Vaughn steam mud gun, and the arrangement of the furnace floor is such that the operator can see the operation of the stock and filling systems at all times.

There are four stoves, 20 by 80 feet high, of a simplified design, two pass, with side combustion chamber. The stoves are fitted with an inverted type of Spearman burner, mushroom hot blast valves, spectacle chimney valves and slide cold blast valves. A stairway runs from the ground to the platform around the top of the stoves, whence another stairway continues to the furnace charging platform.

There is also another stairway from the ground to the furnace top, up the skip bridge.

The design of the stoves is a Marshall two pass type with the checkers of standard bricks instead of special shapes. Special provision is made for uniform gas supply to all checker flues.

From the stoves the waste gases are carried off through an overhead flue to a steel stack, 175 feet high, 8 feet diameter, and brick lined throughout.

The gas burners at the boilers are of the venturi type, giving automatic control of air admission at all gas velocities. There are five 500-horse-power Wickes vertical water-tube boilers with Foster superheaters, working at 200-lb. pressure and delivering steam at 165 degrees of superheat. Waste boiler gases are carried off by three 150-foot steel stacks, brick lined throughout, one chimney to each pair of boilers.

Steam is delivered to the adjacent power house, fifty by one hundred and twenty feet floor space, wherein are housed two 20 by 30-inch Norberg uniflow engines direct connected to two 250 K.W. generators, one only running; two Ingersool-Rand turbo blowers, one only running; Worthington boiler feed pumps, air compressor for casual use about the plant, and jet condenser. Generators supply power to pumps, machine shop and larry car, to various motors about the plant, and for lighting.

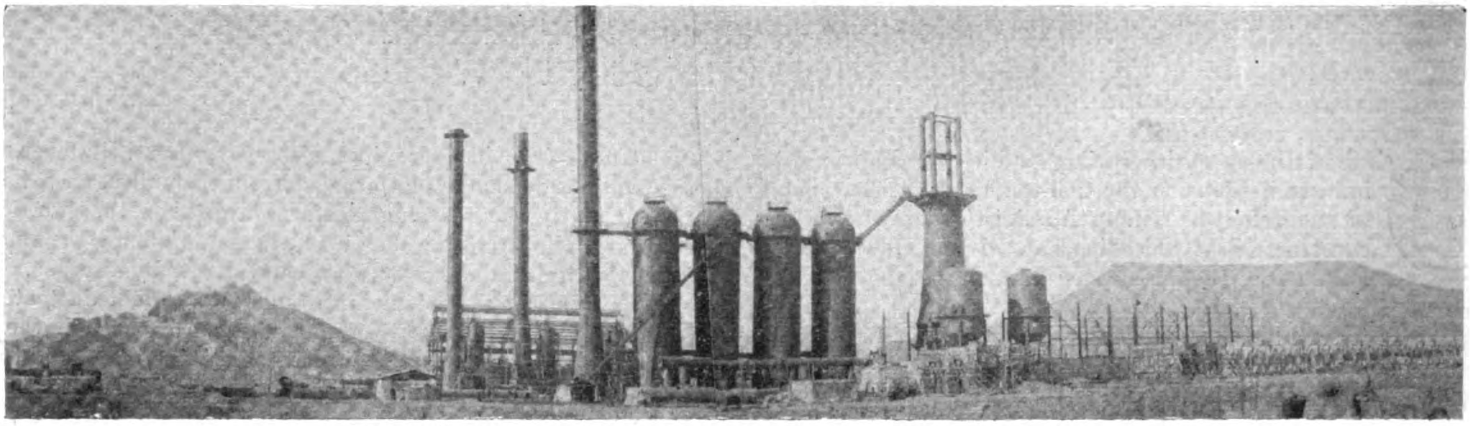
Both boiler house and power house are of structural steel, roofed with corrugated sheets, the boiler house having corrugated steel sides, the power house having brick walls.

Ore and limestone are delivered to the furnace through a concrete tunnel stock system and there are no bins for these materials. The tunnel, 360 feet long and 17 feet inside width, the top being level with yard level, carries a concrete trestle with two standard gauge railway tracks twenty feet above. Ore and limestone are discharged from the cars through the trestle and fall directly on the tunnel arch and on the ground. They then pass through openings in the tunnel arch by chutes and shut-off gate into the scale car traversing the tunnel. This car, automatically weighting its load, carries it to the skip pit opposite the furnace, which is twenty feet below its own tracks, where it discharges by gravity into the skip car which delivers it to the furnace top. The skip cars are hoisted by a double-drum reversing Otis elevator steam hoist, the two cars traveling in opposite directions at the same time.

Coke is stored in a steel bin directly over the ship pit. As the coke drops into the scale car, it passes over a grizzly, and the braize, or fine coke, is screened out. This braize falls on to a concrete platform and is wheeled out by hand up a ramp to the dump.

open hearth steel furnaces, rolling mills, bar and merchant mills, rod mills, sheet mills and other units of a great modern steel plant.

The Lungyen Mining Administration was organized in 1918, and is capitalized at five million dollars Mex., half of which is subscribed by the Chinese government, the other half being owned by individuals, most of whom are prominent men in China. The company has been granted mining rights to exploit the Pang-chia-pao and Sin-gao iron ore deposits of Ling-kwan hsien, the Yen-tung-shan deposits of Hsuan-hua hsien and the Shih-fu-shan deposits of China-hsing hsien, all in the province of Chihli. The total workable reserves of high grade ore of the three areas are estimated to be one hundred million tons. The ores are all hematite of sedimentary origin and carry a little over 50% metallic iron. The Peking-Suiyuan Railway has built a six-mile branch line from Hsuan-hua to Yen-tung-shan, and a system of narrow gauge lines connects the various workings with the standard gauge railway; the cars loaded in the mines are discharged directly into the standard gauge cars. The mines began regular work in January 1919, employing about 2,000 men and produced 700 tons of ore daily. The mining work so far accomplished consists of an interesting system of tunnels and inclines. At the mines there are coolie quarters for 2,000 men, office buildings and a well equipped laboratory.



New Blast Furnace of the Lungyen Mining Administration, near Peking

One of the interesting problems is water supply. The plant requires ten million gallons daily, eight millions is recovered but two millions is lost and must be made up. The water supply, the Hun Ho or Yung Ting River, contains normally about one per cent. of sediment which must be removed. A pumping station at the river side, three quarters of a mile from the furnace, equipped with two electrically driven centrifugal pumps, each of two and a half million gallons daily capacity, deliver the river water to the settling tanks, where the sediment is removed and run to low ground nearby for the use of the farmers. An earthwork reservoir of sixty million gallons is located near the furnace and a concrete reservoir an enlarged pump of half a million gallons capacity, together with a pump house, water treating plant and a ninety-foot water tower is located adjacent to the power house.

For the present, iron is to be cast in the sand in the cast house, two hundred and forty-four feet long by sixty feet wide, and carried out when cooled by hand, or with a traveling crane. Slag goes to the ample dumping grounds by Pollock side-dump steam-dump cinder pots. Other auxiliaries include two Baldwin saddle tanks, sixty-ton locomotives, one fifteen-ton industrial locomotive crane, an ever expanding machine shop and blacksmith shop and a foundry.

The grading and excavation was commenced early in 1921 and the concrete work in May. Steel erection was commenced in July, and according to the present schedule, based on work already done, the furnace should make iron sometime next spring. If this is achieved it will be a time record upon which the administration may justly pride itself.

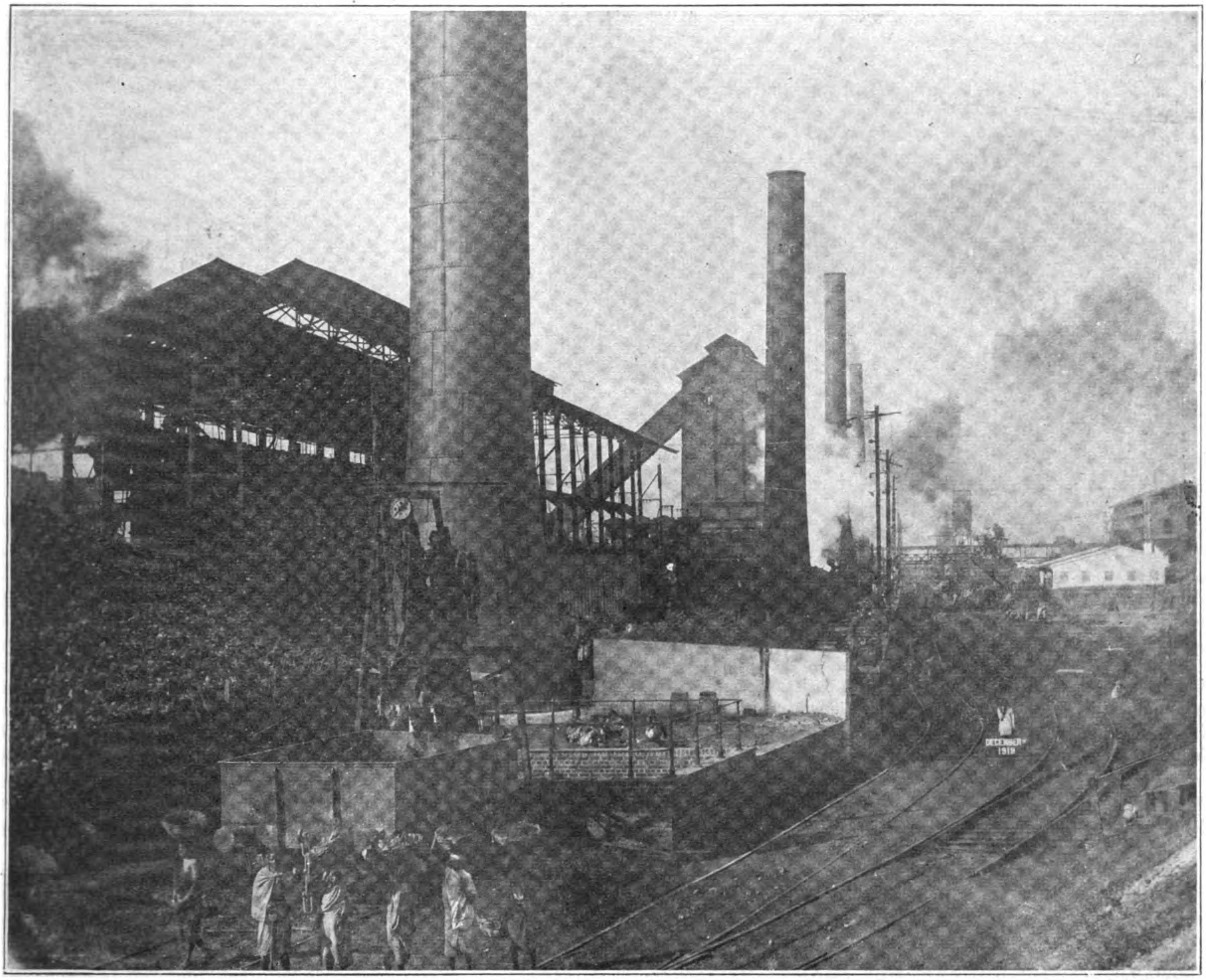
This plant is the first unit of a steel plant which includes for future construction other blast furnaces, by-product coke ovens,

The company has also wisely acquired several large tracts of land nearby and has planted trees to provide timbers for future mining purposes, a new acreage being planted yearly. The engineering staff consists of 20 men, all Chinese, and in 1919 over 150,000 tons of ore were produced. Mining work can be carried on practically every day in the year.

In order to determine the working qualities of the ore a trial smelting was conducted at the Hanyang Iron and Steel Works furnace at Hankow, from May to August 1919, using Lu-ho-kow coke and Tayeh limestone. The ore proved easy to reduce, and the fuel consumption was low, but with a comparatively large slag volume as might be expected from the analysis. The furnace worked remarkably well and the trials were eminently successful. The iron produced contained 3 to 4 per cent. total carbon, .4 to .9 per cent. combined carbon, 1 to 3.5 per cent. silicon, .2 to .4 per cent. phosphorus and .015 to .050 sulphur, these being maximum and minimum figures. The grades ranged from basic to one foundry.

Lungyen owns its limestone quarries 7 miles from the furnace site, and also its own standard gauge branch 4 miles long, connecting it with the Peking-Suiyuan Railway at Sanchiatien, near Mentakow.

The iron and steel production of any nation is always a vital factor in its business strength. It is a most satisfying sign of the times to see that China is increasing the development, for her own use, of iron, the most important of her natural resources, and it is certainly greatly to her credit, that the vision, the initiative, the capital, and so far as is now practical, the personnel, is and has been, wholly Chinese.—*Journal of the Association of Chinese & American Engineers.*



THE TATA IRON AND STEEL WORKS: COKE OVENS

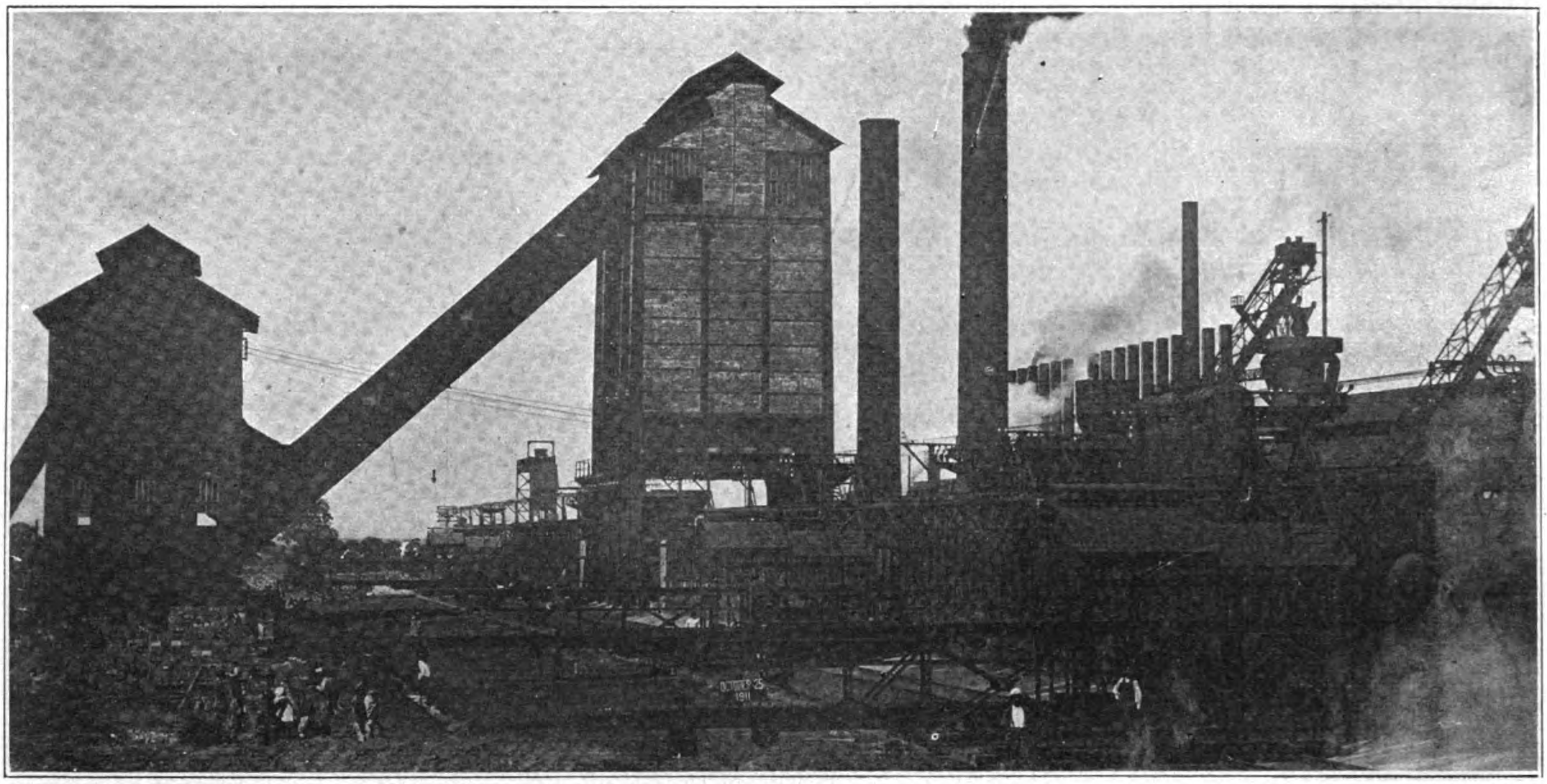
3. The Tata Iron and Steel Works*

JAMSETJI Nusservanji Tata, a member of the priestly caste of the Parsees, who was born in the State of Baroda in 1839, was the first Indian to realize the possibilities of an extensive iron and steel industry in his native land, and he also possessed the foresight to visualize the potential developments which have since come to pass. The operations of the Bengal Iron & Steel Co., Ltd., had already proved beyond question that pig iron could be made profitably in India, and it remained for Mr. Tata to institute the second iron-manufacturing concern and to introduce modern steel works and rolling mills.

The Tata Iron & Steel Co., Ltd., was formed in 1907 with a capital of Rs. 2,31,75,000 (£1,545,000). To-day it has an authorized capital of Rs. 10,52,12,500 (£7,014,166), of which Rs. 3,98,04,570 are issued. After preliminary investigations in India, Europe and America, Mr. Tata engaged Mr. C. P. Perin, of New York, as his consulting engineer. The latter's associate, Mr. C. M. Weld, arrived in India in 1902, and for some years examined various iron ore deposits, many of which had been discovered in the first instance by the officers of the geological survey of India. The earlier work was carried out in the central provinces, and large reserves of excellent ore were proved, but the forest resources of that region did not prove big enough to warrant the establishment of a charcoal iron works there. The surveys were then continued further on towards the east, in order to approach the coalfields of Bengal more closely, and finally the deposits of Gurumaishini in Mayurbhanj were chosen as the source of the iron ores.

The works are situated at Jamshedpur (formerly known as Sakchi), adjoining Kalimati station on the Bengal-Nagpur Railway. This place is 154 miles west of Calcutta, about 115 miles from the Jherria coal mines, 100 miles from the limestone quarries, and 45 miles from the Gurumaishini iron ore mines. The following description of the Tata works is compiled from papers by Messrs. Perin, Tutwiler and Surtees Tuckwell. The writer is especially

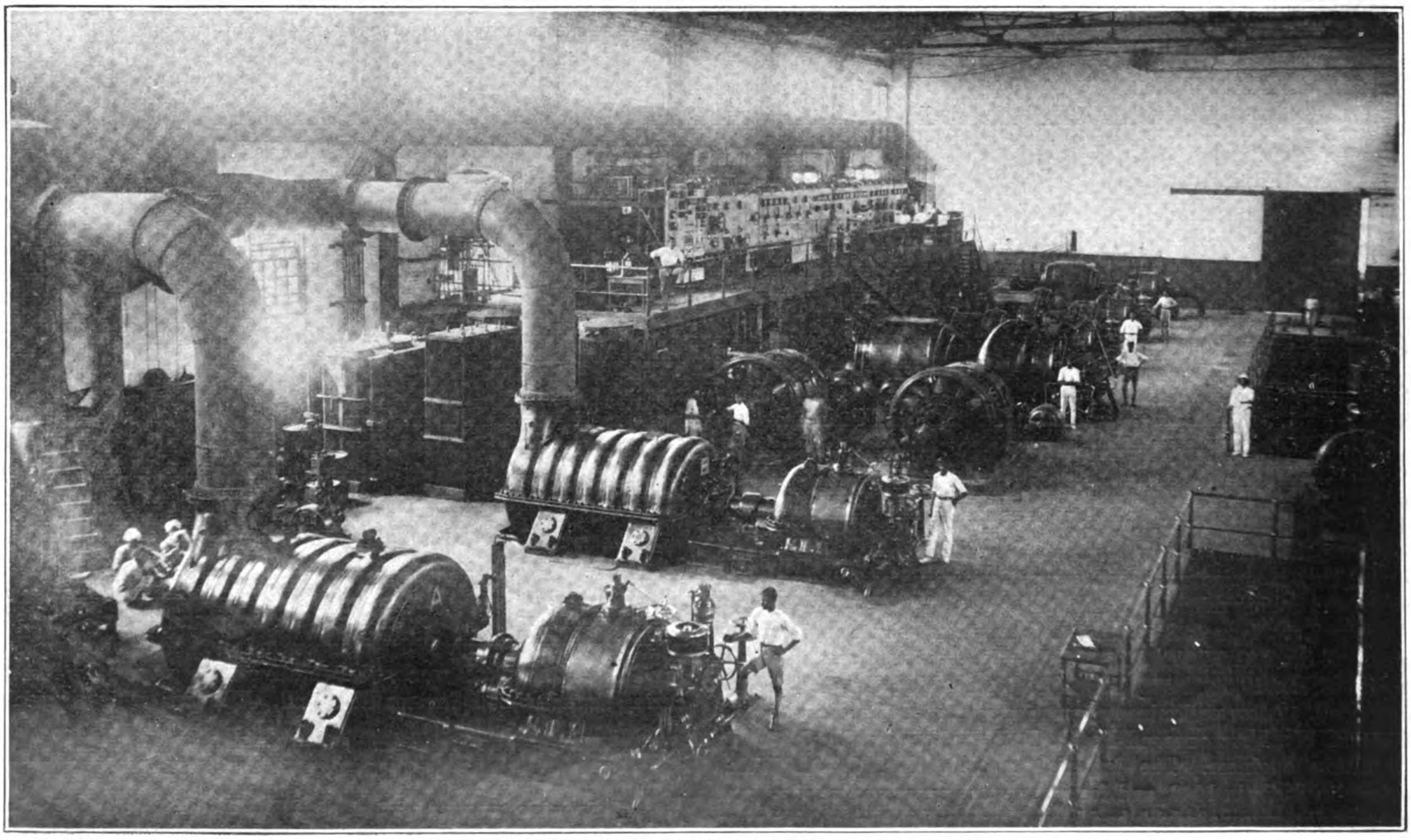
*This article appeared originally in *The Mining Magazine* of London, but has been corrected and brought up-to-date by the management of the Tata Iron and Steel Works.



TATA IRON AND STEEL WORKS: ANOTHER RECENT VIEW OF COKE OVENS

indebted to the last-named for his kind assistance. Construction commenced in 1908, and the Sakchi jungle was rapidly transformed into a town, which now promises to become the centre of one of the leading industrial regions of Asia.

The two original blast-furnaces of the company, each 77-ft. high and 19-ft. in diameter, with a capacity of 200 tons of pig iron per day, were blown-in in November, 1911, and September, 1912, respectively. Each furnace is equipped with up-to-date charging apparatus and four Cooper-Kennedy stoves. These two furnaces have since been enlarged to turn out 280 tons per day each. The shortage of ferro-manganese in India during the war led to the rapid erection of a third furnace of a somewhat smaller type in 1919. At the present time two of the most modern skip-filled furnaces, with a capacity of 600 tons per day each, are nearing completion.



TATA IRON AND STEEL WORKS: POWER HOUSE

The original coke-oven plant consisted of 180 Coppee non-recovery ovens. To these have been added a battery of fifty Koppers by-product ovens and a Simon Carves sulphuric acid plant, which supplies the acid necessary for the production of sulphate of ammonia. Three batteries of Wilputte design, each containing fifty ovens, are being added, together with extensions to the coal tar, ammonium sulphate, and benzol recovery plants. All the silica shapes requisite for the construction of these new ovens have been made in India by the Kumardhubi Brick Co.

The steel works plant consists of one 300-ton mixer, which receives the molten pig iron from the blast-furnaces before it is charged into the open-hearth furnaces. There are seven of the latter, four of which have a capacity of about 55 tons per heat and three of 75 tons capacity. These enable an output of 27,000 tons a month to be maintained. The new steel plant includes two 25-ton Bessemer converters, two 100-ton tilting open-hearth furnaces, and one 1,300-ton mixer. The converters will remove all the silicon and as much carbon as is desired from the iron, leaving the tilting furnace the duty of removing the phosphorus and sulphur and bringing the iron to the required percentage of carbon. The elimination of these elements is said to reduce the time necessary for the finishing of a heat in the tilting furnace by about 75 per cent. The large mixer is being erected to store the hot metal from the blast-furnaces over the week-ends, when the open-hearth plant is not working. The present 300-ton mixer is to be used as an additional open-hearth furnace after the new mixer is built. Provision has also been made for the installation of a 250-ton recarburizing mixer, a third converter if necessary, a third duplex tilting open-hearth furnace, and three Heroult electric furnaces for the manufacture of special steels or ferro-alloys.

There are four soaking pits in the steel works, equipped with mechanically operated lids, and an electric overhead charging and drawing crane. The ingots are made 21-in. by 19-in., and weigh between 2 and 3 tons each. They are removed by a self-tipping electric trolley to the mill tables.

The blooming mill consists of a 40-in. mill, operated by a Galloway engine of 11,000 h.p. In this mill the ingots from the soaking pits are made into blooms and billets. Another 40-in. reversing motor-driven blooming mill with hydraulic manipulator and followed by hydraulic shears is being added.

The present 28-in. finishing mill has three sets of rolls, and is worked by a 12,000 h.p. engine. It is capable of turning out rails from 100-lb. to 30-lb.; beams from 15-in. by 6-in. down to 5-in. by 3-in.; angles from 6-in. by 6-in. to 3-in. by 3-in.; and channels from 12-in. by 4-in. to 6-in. by 3-in. The blooms from the blooming mill are reheated before they are rolled, and the sections of rails or structural materials, after being rolled to the required dimensions, are cut by circular saws into the necessary lengths, and are conveyed mechanically by rollers to a cooling bed of the moving type. From the cooling bed all the bars and rails are passed through straightening machines in the finishing department, which also contains the usual planing and drilling devices. The products are handled by an overhead electric crane. The motor-driven blooming mill will serve a new 28-in. to 30-in. combination rail and structural mill.

There is one 16-in. bar mill making light rails weighing 30-lb. to 14-lb. to the yard; angles of all sizes from 3-in. to 1½-in.; channels from 4-in. to 1½-in.; beams of 4-in. by 1¾-in.; and fish-plates for rails. There are also two 10-in. mills devoted to the production of lighter sixes of flats, squares and rounds. The new bar mill is of the latest continuous type, and will take billets from the sheet, bar and billet mill at present under erection. Independent motor-driven rolls are being added for the production of wire rods.

The plate mill is now nearly completed in a separate building over 1,000-ft. long and about 100-ft. wide. The mill will produce plates from ⅛-in. to 1¼-in. thick in various widths up to 96-in. and various lengths up to 50-ft. It is to be driven by a 2,000 h.p. motor taking alternating current at 3,000 volts, and is provided with bottom-type reheating furnaces. The building also contains the straightening and shearing machines for the plates.

The sheet, bar, and billet mill is in direct line with the new blooming mill, and will roll billets from 3¾-in. square to 6½-in. square for the bar mills. It will also roll sheet bars up to 8-in. wide for the sheet mill. It is proposed to finish steel sleeper sections up to 16-in. wide on this mill.

The sheet bars will be delivered from the mill just described to the sheet mill proper, where six special furnaces will reheat them. The rolling equipment consists of two jump rolls, two balanced rolls, six finishing mills, and two cold rolling mills, all driven by a 4,000 h.p. motor taking alternating current at 3,000 volts. This mill will produce sheets to any width up to 38-in., and of any thickness desired from ⅛-in. down to 0.01-in.

The present scheme of extensions also contemplates a bolt and nut shop with a sufficient number of machines to produce 50 tons per week; a steel sleeper press: a cast-iron pipe foundry; and a new roll-turning shop. A large new machine-shop is under erection, in which the housings, castings and the bulk of the heavy components for the new rolling mills, etc., are now being made. In addition there are shops for pattern-makers, carpenters, blacksmiths, locomotive repairs, electrical repairs and structural shops for bridge, roofs and buildings.

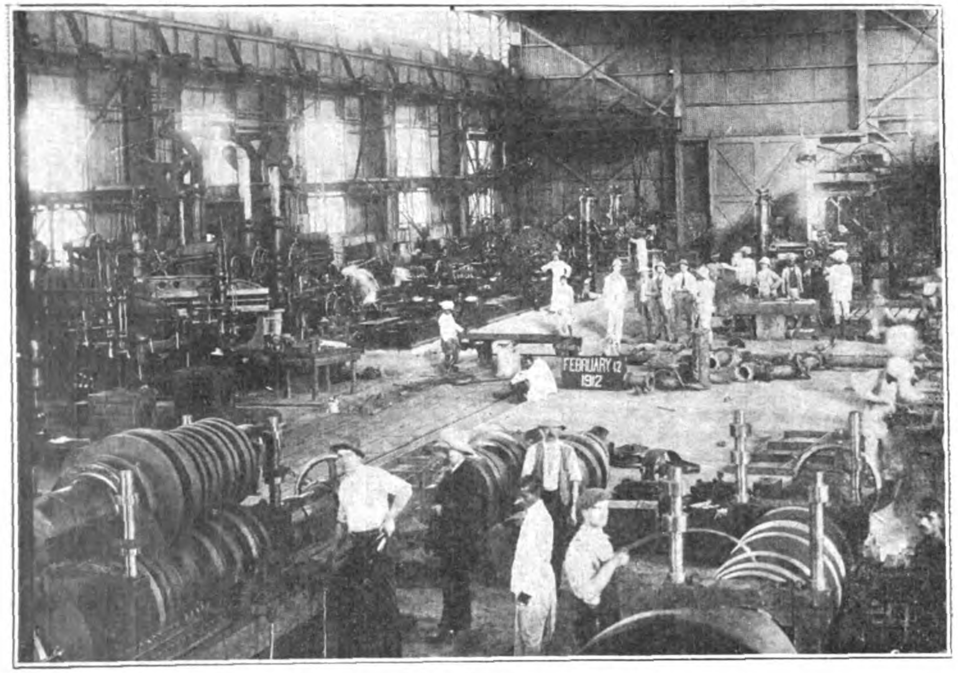
The power-house contains four turbo-blowers, which supply 32,000 cubic feet per minute to the blast-furnaces under a pressure of 15.5-lb. per square inch. The plant consists of one 5,000 kilowatt, two 1,000 kilowatt and one 1,500 kilowatt, 3,000 volt turbo-alternators, running at a speed of 3,000 revolutions per minute, and three transformers of 1,250 K.V.A., 3,000 to 440 volts, and two motor generator sets of 500 kilowatts each.

To supply the power for the new extensions, the whole of which will come into operation progressively within the next two years large additions to the former power-plant have been necessary. These include a large battery of new boilers, fired with blast-furnace gas, two 10,000 kilowatt, one 5,000 kilowatt, one 4,200 turbo-generators, one 2,000 kilowatt mixed pressure turbine, the steam for which is principally obtain from the existing rolling mill engines, and the necessary transforming equipment to step down from high to low-tension. Corresponding increases have been arranged in the water system, pumping plant, the transporting department, laboratory, offices, etc., to say nothing of the essential augmented reserves of raw material.

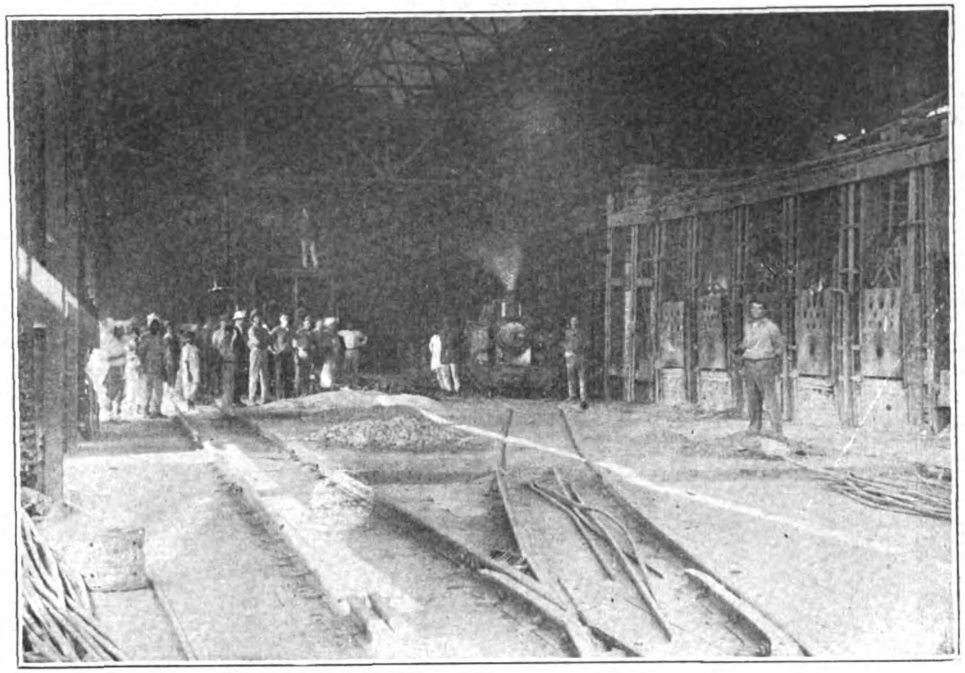
When the present extensions are completed, the Tata iron and steel works will have a potential output of 700,000 tons of pig iron and 580,000 tons of steel ingots per annum. Of the latter, it is proposed to convert some 426,000 tons into finished and semi-finished products, and the whole of the new plant has been so laid out that future extensions may be added with the least inconvenience.

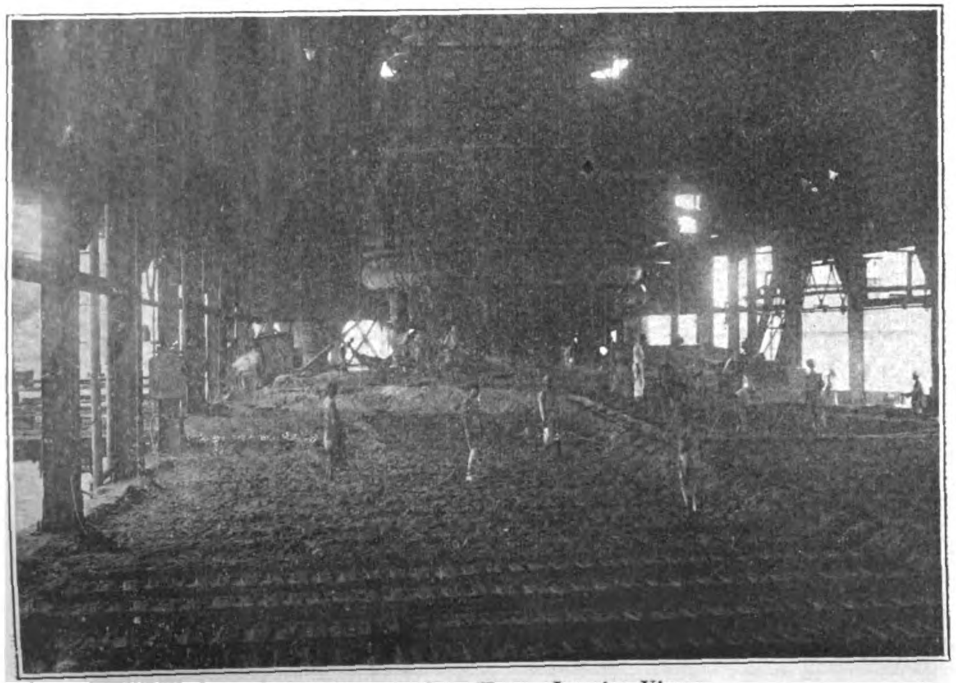
The company owns its own collieries, iron ore mines, manganese ore mines, wolfram mines, and limestone and magnesite quarries. It also holds a large interest in the Kumardhubi Silica & Fire Brick Co., Ltd., which makes silica bricks from the gannister deposits of the Gaya region, magnesia products from Mysore magnesite, and other refractories from fire-clay, chromite, etc. The Tata Company to-day finds employment for 35,000 men and women, and, as it is still the custom of the ignorant to under estimate the capability of the Indian workman, it may be pointed out that the management has gradually been able to reduce the number of European and American employees and to substitute Indian labor. Out of 137 covenanted Europeans and Americans, 75 are employed as supervisors at the steel furnaces and rolling mills, which between them find employment for 4,200 men. At the blast-furnaces there are only 8 Europeans to 1,600 Indians; in the mechanical department 6 to 3,000; and in the traffic department only 1 to 1,500. The chemical laboratory originally employed five European chemists. Now only the chief is a European, the remainder of the staff being twenty-one Indians. According to Mr. H. Surtees Tuckwell, "in very many instances Indian workmen have shown themselves possessed of extraordinary skill and manual dexterity, and the electrical department is under the superintendence of an Indian gentleman, a graduate of an Indian

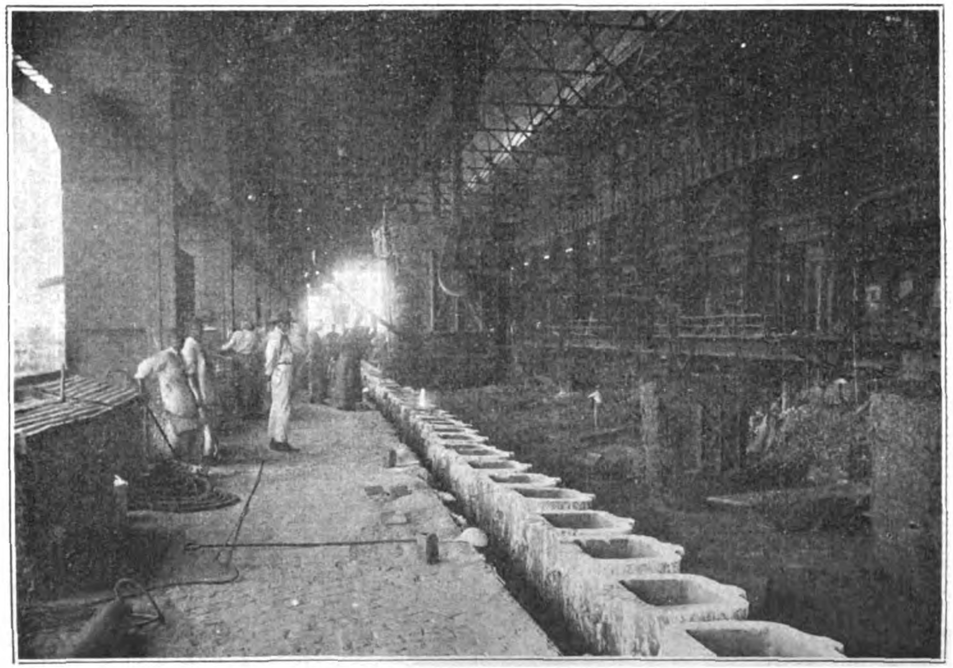
TATA IRON AND STEEL WORKS

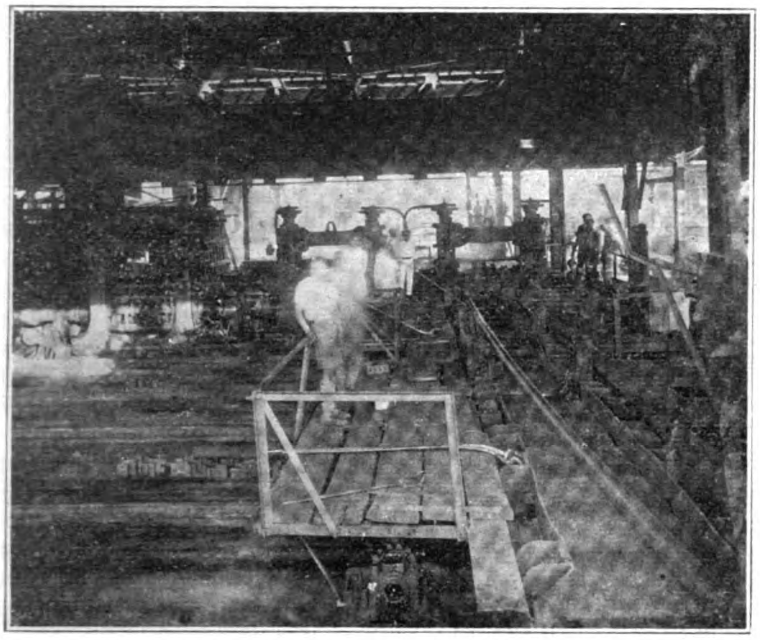


Machine Shop

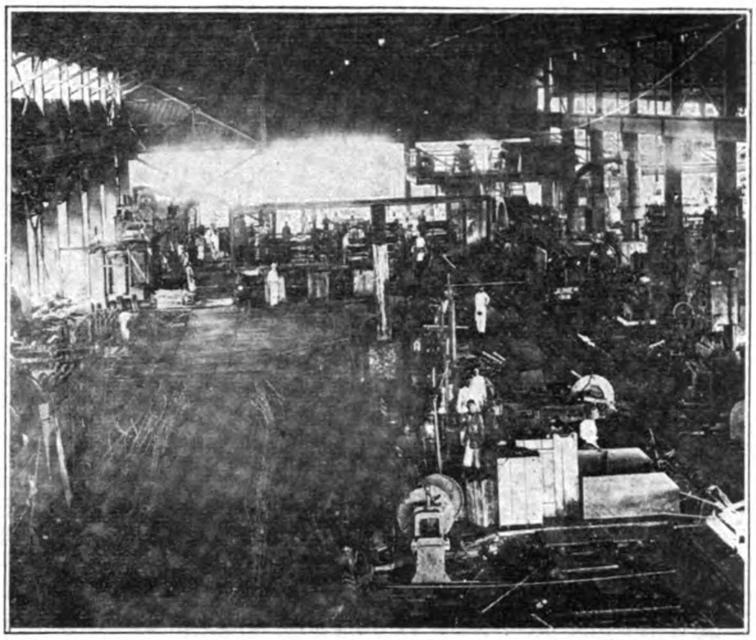

Steel Works, Charging Side


Blast Furnace Case House, Interior View


Steel Works, Pouring Side



Tata Iron and Steel Works: Rail Mill

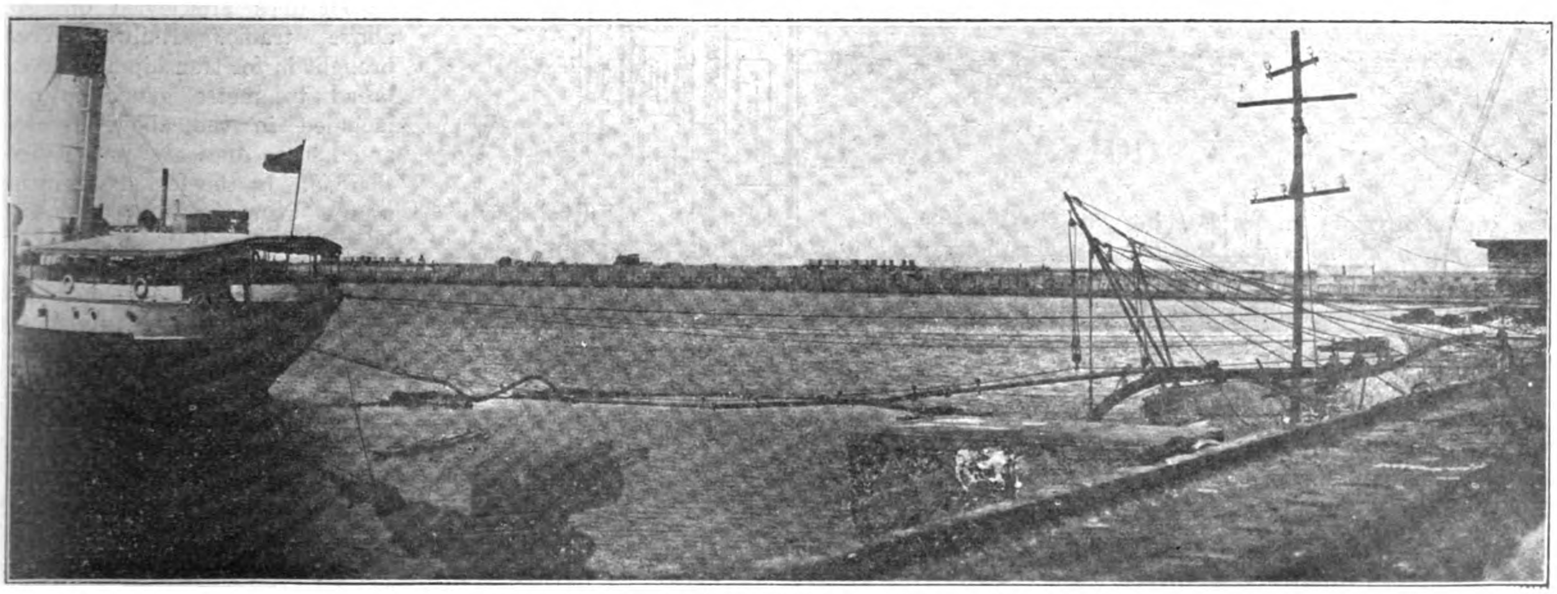


Tata Iron and Steel Works: Bar Mill

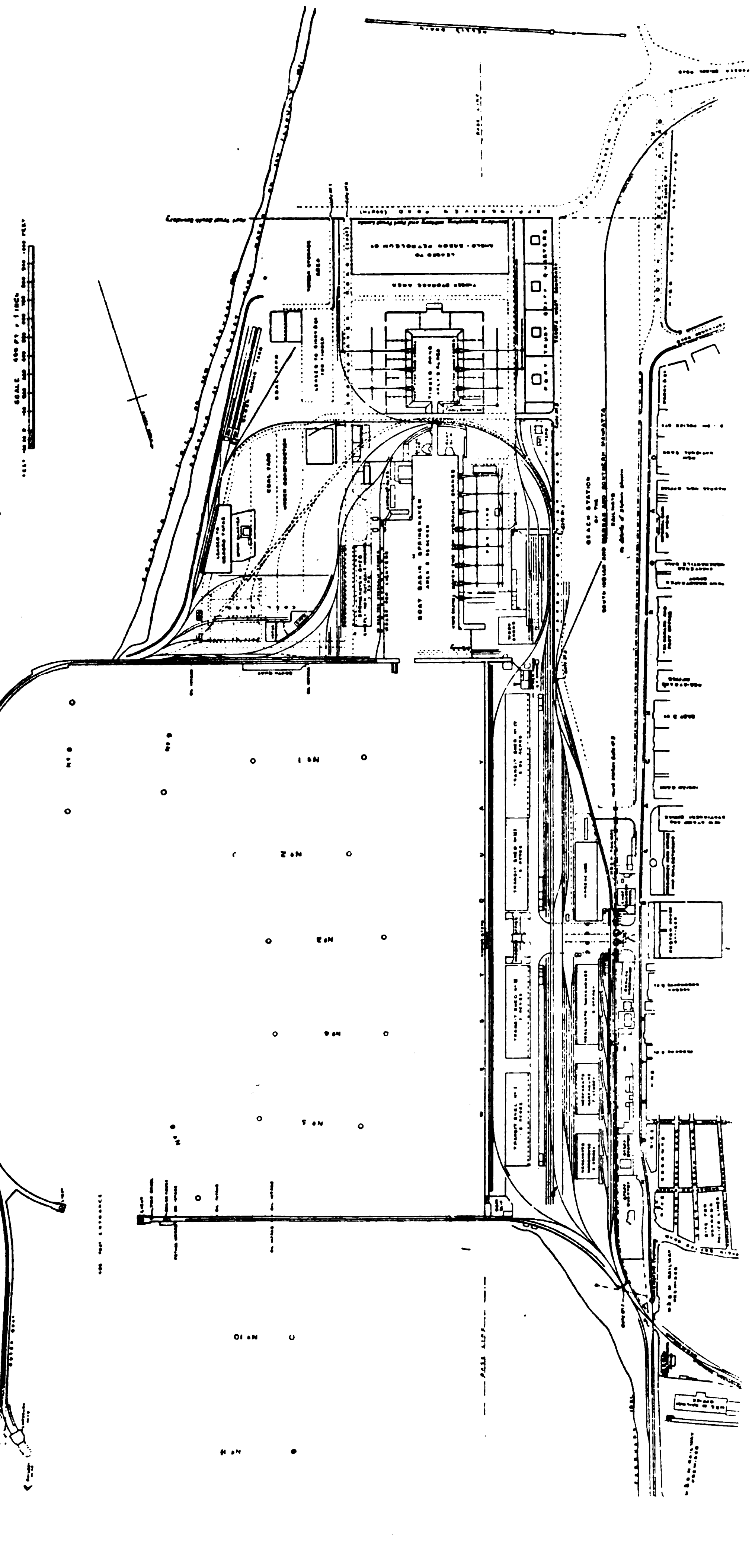
University, assisted by a staff of Indian wiremen and electricians." The coke-oven department is also under the sole charge of an Indian. Social welfare work among the employees is actively undertaken at Jamshedpur, which is a well-laid out town possessing a modern water supply and sanitation system, hospitals, schools and recreation grounds.

The Madras Harbor Works

IN the July 1921 issue of THE FAR EASTERN REVIEW there appeared a résumé of the administration report for the official year 1919/20. The 1920/21 report made by the chairman of the board of trustees, Mr. H. H. G. Mitchell, O.B.E., M.INST.C.E., M.I.E. (Ind.), says that in the past year the tonnage of goods handled and their value fell very little short of what they were in 1919-20, the record year. As was anticipated, there was a very marked revival in the foreign import trade, the value of which was 21½ crores of rupees against 10¾ crores in 1919-20, but this gain was counterbalanced by a drop of nearly 10 crores in foreign exports. There was also a drop of nearly two crores in the coasting trade, chiefly due to the falling off in the imports of food-grains from Burma. The sea-borne tonnage of goods handled amounted to 810,159 tons against 818,993 tons in 1919-20. The value of the private trade of the port, excluding government transactions and movements of treasure, amounted to 35½ crores of rupees against 36½ crores in 1919-20; it represented over 50 per cent.



MADRAS HARBOR—View of Suspended Steam Pipe and Floating Oil Pipe



MADRAS HARBOUR IN 1921

of the trade of the whole presidency.

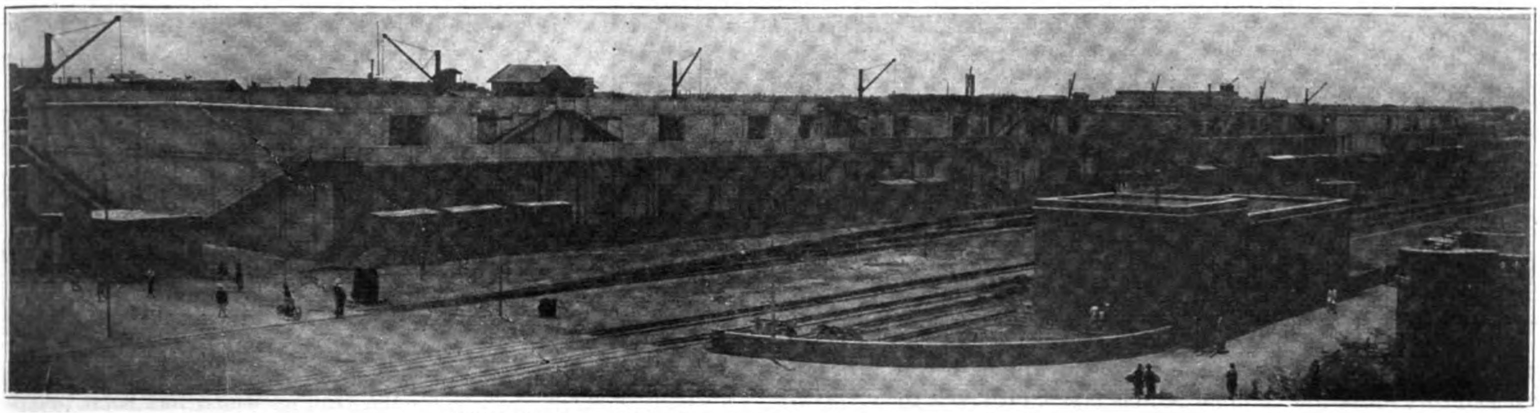
During the year 648 vessels with an aggregate tonnage of 1,662,444 tons, including 351 from foreign ports, 171 from coast ports and 103 country sailing craft, called at the port against last year's figure of 521 vessels of 1,166,352 tons. Several new lines made Madras a port of call, notably those trading direct with America. The vessel of the greatest tonnage which entered the port was s.s. *Khyber* of Liverpool of 9,014 tons and 5,685 tons net register, and the vessel with the deepest draft was s.s. *Morvada* drawing 29-ft. 6-in. Passengers to the number of 72,720 arrived at and 83,801 left the port making a total of 156,521. Out of 545 steamers that used the port 293 used the quays for landing cargo, passengers, horses, etc., 34 used the north and south oil berths for discharging oil, 5 used the outside berths for landing explosives and combustibles and 9 anchored in the fair way.

Tonnage Handled.—The total tonnage of goods which passed through the port in 1920-21 amounted to 848,756 against 940,564 in 1919-20, imports contributing 717,740 tons and exports 131,016 tons against 781,263 and 159,301 tons respectively in 1919-20. Of the above total, 810,159 tons was sea-borne against 818,993 tons 1919-20.

The difference between the total traffic and the amount sea-borne consists almost entirely of rail-borne coal brought in for bunkers and coal for transhipment from broad to metre gauge, harbor dues are levied on the above traffic. Railway coal brought in for transhipment from broad to metre gauge is not included in the above figures and harbor dues are not levied thereon. In the last six months of the year the import of coal by rail has practically ceased.

ENGINEERING.

Cyclone Damage Works.—During the year the steel caisson, weighing 240 tons, filled with concrete, forming the head of the rebuilt portion of the sheltering arm, was sunk. The first 25-ft. of steel work, weighing 142 tons, was erected on the Port Trust slipway and launched in June. The erection of the remaining 30-ft. was carried out afloat,

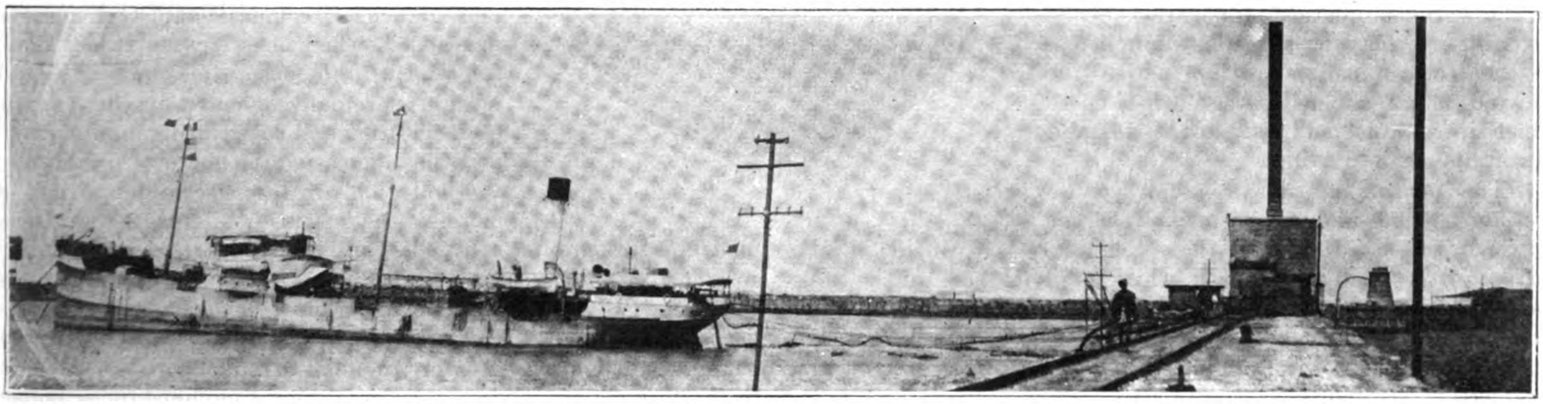


MADRAS HARBOR—Range of Newly Completed Warehouse

and completed by the end of September by which time, with the addition of 530 tons of concrete, she was drawing 26-ft. The finished caisson was then flooded and kept on the bottom, in the north-east corner of the harbor, during the November cyclone season. In January, she was refloated and towed out under lee of the sheltering arm where a further 610 tons of concrete were filled into her. This load brought her draft down to 36.5-ft.

Early in February 1921 she was placed in position in 40-ft. of water. Three days later unexpected bad weather set in and she started to move and worked herself into the bottom. After all attempts to steady her had failed, she was finally floated out to save her from being lost altogether. Additional freeboard was provided by adding two extra 4-ft. strakes and the sea bed at the site was hardened with broken stone and levelled off. Five weeks later, on 12th March, 1921, a second attempt to place her in position was made and proved successful. The remainder of the concrete filling was then put in, and by the end of March, 4,048 tons had been deposited in her. Five slices of block work measuring 30-ft. had to be put in temporarily in advance of the semi-permanent head to enable the Titan crane to plumb the well of the caisson for grabbing. These slices will be taken out and rebedded after the caisson has been sunk to her final level.

Cement.—Eight hundred and forty-eight tons of cement were purchased during the year. Of this quantity, 500 tons were obtained from England and the balance was bought locally, 250 tons being of local manufacture. 1,136 tons were used. The stock at the end of the year was 748 tons.



MADRAS HARBOR—Vessel Discharging with Steam Supplied from a Boiler on the Groyne

Engineering Works in Ceylon

THE first steam-roller manufactured in Ceylon has been at work for six months. Colombo government factory, where it was made, has now undertaken the construction of six similar machines. Their cost is about half of that of the imported article, and they suit local conditions better. The only portions not made locally are the cast steel gearing and cylinder lubricators.

During the war a 3-ton steam wagon was made at the Colombo government factory. It has been at work for four years transporting road metal for the public works department in the Negombo district. The government has now authorized the building of two similar steam wagons. In this case also the cost, compared with that of the imported article, is very low.

A wind-mill made at the Colombo government factory last year is now at work pumping about 80,000 gallons of brine every 20 hours to the crystallizing tanks of the Elephant Pass government salt works.

Three steam-driven saw mills at the government factory saw about 600 tons of timber per annum for wagon building and other purposes. The sawdust feeds a 150 h.p. power plant made entirely at the government factory, and saves some Rs. 8,000 per annum.

At the government factory about 30 steam-rollers of different types are overhauled every year.

The machine-shops for handing bridge-work are equipped very fully with modern tools. Parts of a bridge with a span of 175-ft. are now being produced. The annual output of finished material from the workshops, principally for the public works department, totals about 2,600 tons.

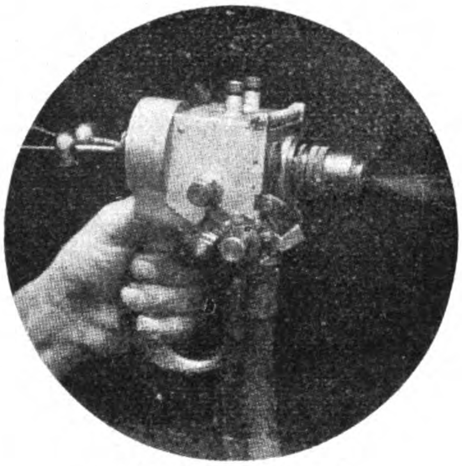
There are only a few engineering establishments at Colombo dealing with ship and motor repairs. Prospects in the engineering trade in Ceylon, considering the steadily-growing local and Indian demands, are considered good.

Schoop's Metal Spray Process

A Valuable Invention

MR. SCHOOP of Zurich, Switzerland, was watching his children with a Flobert rifle when he chanced to note that the bullets striking a wall were crushed thereon, producing a strongly adhering lead coating. This led him to make some experiments with small shot, which brought out the fact that the grains of lead on being crushed form a partially homogenous layer, provided their surface is cleansed and free from any trace of graphite. This observation led, through a number of more or less successful stages, to the processes which have now been technically developed to a high degree of perfection.

The apparatus consists of a vessel containing the metallic powder, or which the lower part can be closed by an ingeniously constructed valve with an irregular seating surface. Compressed gas, after being heated in a special heating device, is passed through the pipe into the upper part of the apparatus in order to force the powder out under pressure; the greater part of the gas from the same source, after having a rotary motion impared to it, acts on the powder expelled from the vessel and hurls it with great force through a nozzle and a metal tube on to the object to be coated.



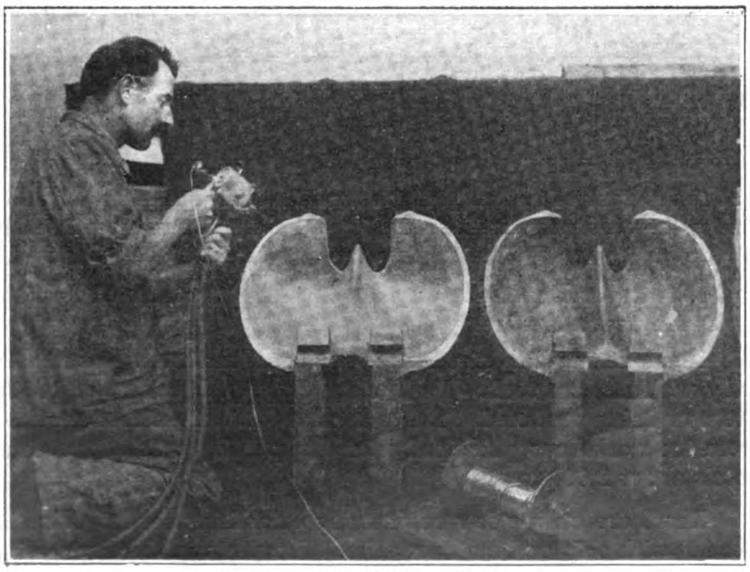
Schoop's Metal Sprayer

Before passing on to the consideration of the various practical applications of the invention, it may be said that the microscopical sections made show how closely the sprayed metal adhers to the surface on to which it is projected, and how it eats and fills up its smallest pores.

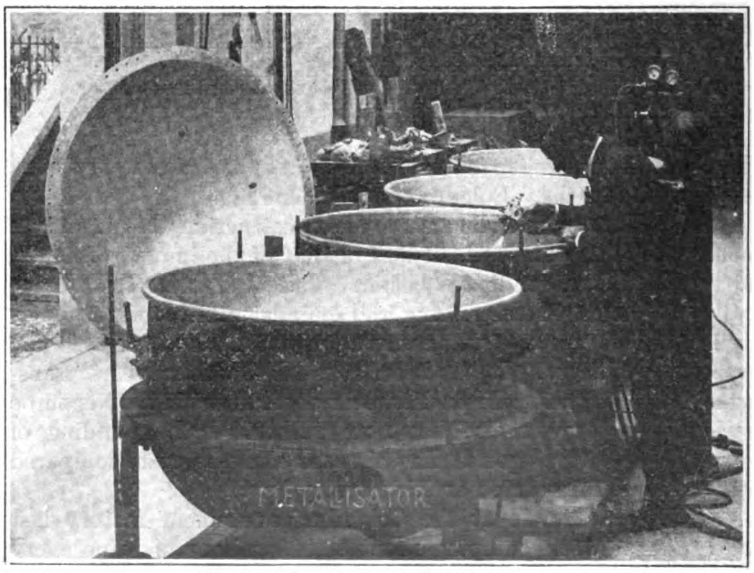
This coating is always equally dense and homogenous and can be made adherent or removable according to the preliminary treatment of the surface to be coated. The list which is given here of the uses for which the spraying process has already been employed, or in which it may possibly be used, cannot in any way claim to be complete, but is only intended to provide examples of the commercial possibilities of the process.

The first possibility is the application of the spraying process for coating objects with lead or zinc or the plating of the interior of vessels, vats, etc., for use in the chemical industry, in mines and many other works. Any vessel of partially any material or any part of an apparatus, which is difficult to get at, can be protected against rust. The process is of particular advantage where angular irregular bodies are concerned, and especially in eases where it is desired to cover large surfaces of finished constructional parts as a protection against rust.

It is of interest to recall the trouble which has been taken to obtain successful protection against rust in the cases of high structures which are exposed to the action of the weather, such as iron pridges, and the fact that of late years many bridges lave been built of armored concrete largely owing to the enormous exbenditure which the constant renewal of the paint of the iron bridges necessitated. If the finished parts of structural iron work are properly sprayed, there should be no further expense beyond the one initial outlay for a considerable time. There is ample opportunity of observing on many railways how very much such structures suffer under the action of the weather, in spite of the most careful painting. Again, in many railway stations, the iron structures are greatly damaged by smoke. The value of spraying process in this direction can be recognized at once. Before leaving the consideration of the heavier engineering branches one branch of technical industry must be mentioned which has always stood alone, for whilst in modern times processes and machines are daily invented for the purpose of facilitating and accelerating manufacture, and thus increasing the power of production, we find that in the electro-deposition of metals, the laws of nature themselves place insurmountable obstacles and the importance which the spraying process has in this connection is obvious. Theory teaches us that by galvanic means we can deposit with a current of 1 ampere not quite 1.2 gr. of copper in an hour. If the current density per sq. decimeter exceeds more than 0.3 to 0.5 amperes at the most the copper deposit becomes under ordinary circumstances porous or spongy. It is not, therefore, practical to deposit by ordinary methods more then about half a gr. of copper per hour, which forms a coating of 0.02 millimeter thickness. Of late years a

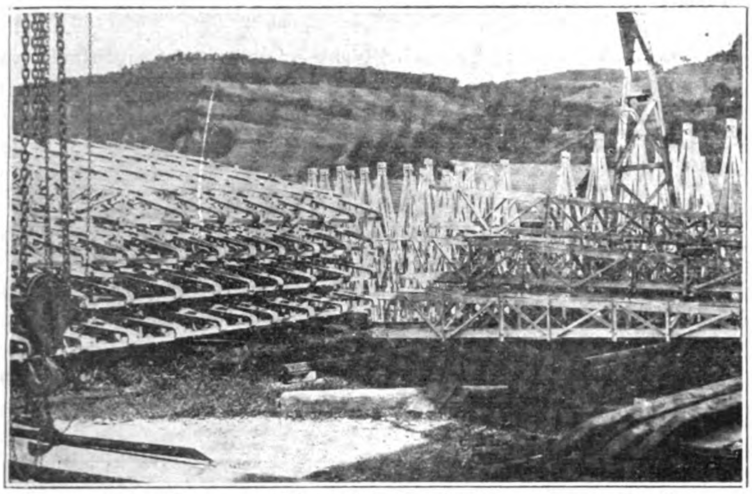


Spraying Water Turbine Blades



Coating Confectionery Boiling Vats.

firm has invented a rapid copper plating bath (which permits a deposition of about 40 gr. of copper per hour). However such cases are exceptional, for copper is the most suitable metal in the electroplating industry, whilst in the case of other metals all the most ingenious devices have not advanced far beyond the above

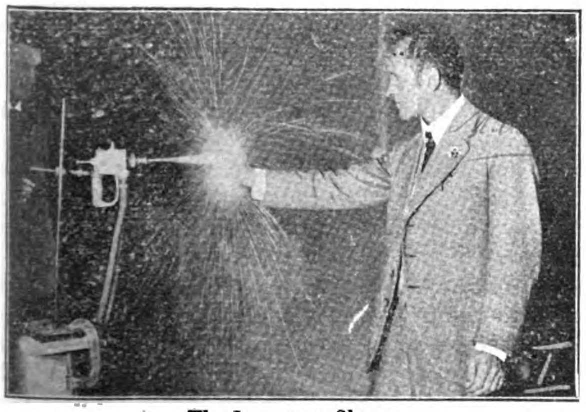


Transmission Towers and Spreaders for the Swiss Electric Railways Galvanized by the Schoop Process to Prevent Rusting

mentioned limited means. Further a deposit of even 40 gr. of metal per hour per sq. decimeter cannot be compared with the operation of the spraying process, which can deposit this quantity in a fraction of a minute, the deposition taking place with the same precision and the same close adherence of the metal to the smallest hollows and irregularities as is the case with electric deposition.

Metallic surfaces only need cleaning with a sand blast before spraying, and objects which do not conduct electricity do not require to be first rendered conductive since the sprayed coating can be produced on any material. In addition to this, the process offers the great advantage that it permits us to work the one metal which the art of electric deposition has up till now been unable in spite of all efforts to utilize: aluminium.

The possibilities of applications of the process for industrial purpose are, of course, quite unlimited, especially since the temperature of the metal spray is very low, so that not only combustible materials, such as wood and paper, but also substances which are actually highly inflammable, such as celluloid, and even explosives, can be directly sprayed. The coating of fabrics with metal for airships, thus rendering them more gas tight whilst not appreciably increasing their weight by the thin metallic coating (which may be of aluminium), may provee of just as much importance as the coating of wooden frames and fabrics of aeroplanes for their protection against the weather and for increasing their stability. As a matter of fact, the coating of wood with metal is in itself virgin soil, and has many possibilities which are obvious. For example, the coating of ship bottoms and other ship parts and of telegraph poles and masts for protection against weather and insects.



The Inventor: Shoop

Packing cases, etc., can easily be strengthened by spraying the edges of the boxes for oversea transport. The task of soldering up a box containing dynamite must be a very unpleasant one, but it can be affected without danger by spraying process.

After what has been said it is unnecessary to reiterate the advantages which the applications of the spraying process offer in connection with artistic industrial works, for instance, coating wood, plaster, leather or celluloid objects wholly or partially with metal, or for producing patterns on surfaces by means of stencils. With regard to the taking of impressions of parts to the body, it may be mentioned that in Paris a successful attempt has been made to obtain finger-prints of criminals by the spraying process. Finally, in connection with this group of removable coatings, there is one branch in which the spraying processes are of the greatest importance, namely, the manufacture of casting and blocks. The spraying processes offer a most valuable substitue for all these methods since they are equal to them in accuracy and are superior to them in rapidity. For instance, it is possible to prepare in one hour from one single negative block as many as thirty finished blocks which are equal in every respect to electro-types. It is also possible to make blocks of iron and even of steel; formerly these could only be produced by means of highly complicated engraving processes on a steel plate.

In all probability the Schoop spraying processes will constitute a great advance in not a few branches of technical industry and amongst these branches are some for which it will create an entirely new history.

Railway Construction in China and Japan

JAPAN ORDERS RAILS.—An order for 13,000 tons of rails has been given an American corporation by the railway department. Although different according to year, the annual consumption of rails by the government railways is 55,000 tons on average, of which the larger portion is supplied by the government Iron Works, whose yearly capacity is about 40,000 tons of rails minus supplies to private railways. The railway department found, however, the limited supply by the iron works inadequate for its needs this fiscal year, which have been increased somewhat over usual requirements. This compelled it to give the above order to the American firm on December 26, including 60 and 75-lbs. rails for arrival at Otaru, Yokohama and Kobe until March 31. The contract prices are kept sceret, but are conjectured by some to be in the neighborhood of Y.110 per ton, which is Y.10 or 15 lower than the Japanese products, which are stated, further, to be inferior in quality.

LIGHT RAILWAY, ANHWEI.—The Woo Shun Coal Mining Company at Pei-lee-ching in Shih-hsien, Anhwei, will build a light railway from the mines to Ma-dao-ching, a distance of 25 *li*.

CHUKIANG-HSIENTU RAILWAY, HUPEH.—The building of a railway from Chu-kiang to Hsientu, western Hupeh, is projected by the local gentry to develop the rich mines in these districts.

BRIDGES OVER YANGTZE RIVER.—Dr. Waddell has recommended to the Peking government the construction of three large bridges at an estimated cost of $70,000.000 :—(1) The Han-kiang bridge over the Han-kiang connecting Hankow with Hanyang; (2) the Yangtze bridge over the Yangtze River connecting Wuchang with Hankow; (3) the Yangtze bridge over the Yangtze River connecting Nanking with Pukow.

The Sugar Industry of the Fiji Islands

The Problem of Indian Labor

By Thos. J. McMahon, F.R.G.S.

COMPARED with other island groups of the South Pacific, the Fiji islands have a claim to a wide and wonderful development. While there is much credit to be given to the skilful, business-like management of enterprises, and the splendid energies of the white settlers, the fact is very clear that the administration has been and is encouraging development. Undoubtedly a sane balance has been maintained by the administration in assisting trade and development, while fully protecting the interests of the native people.

Traveling through the group it is most impressive to see the vast areas under sugar cane, the number, size and modern equipment of sugar mills, the hundreds of miles of excellent light railways, the great solid steel bridges spanning the wide rivers, and Fiji has mighty rivers on its two big islands of Viti-levu, and Vanua-levu—the variety of motor traffic on harbors, rivers and roads, and the thousands of people in employment. To find a city of the size, and business importance of Suva, the capital is in itself a fine indication of progress. That picturesque city with its well-paved streets, avenued with splendid shade trees, with its liberal electric lighting, its ample water supply, and its long stretch of habor wharves, that can be considered as the best of the Southern Pacific territories. This city is at once the grandest evidence of the energies and enterprise of the settlers, the progressiveness of the administration. It would be impossible not to be especially impressed with the extent of settlement on every hand, and in all the bigger islands. Though the settlements of Indians, introduced to the islands 48 years ago are both mean and unpicturesque in appearance. The coast lines of the whole of the island territory is one unbroken chain of plantations, sugar, coconut, sisal, bananas, and other tropical products. There are on the rivers, and running to the hills great stretches of pastoral and dairying lands that cannot be excelled in quality even in Australia, or New Zealand. Indeed, summed up Fiji can be characterised as a land where marvellous things have been accomplished, a land which can be pronounced as one of magnificent fertility, and remarkable and varied resources.

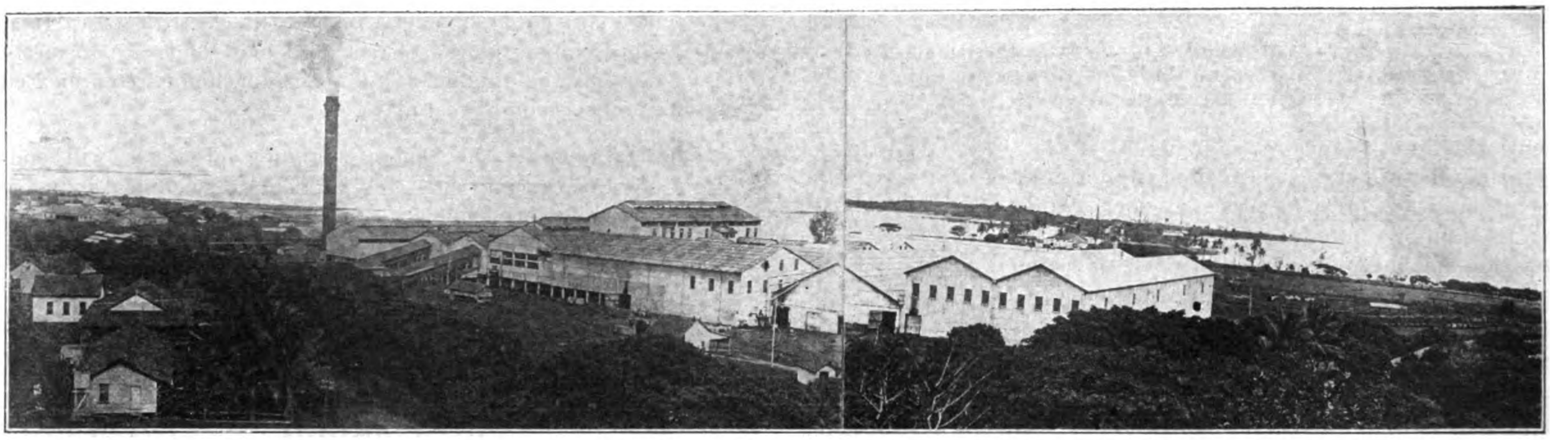
Fiji consists of 250 islands, 90 of which are inhabited, with a total area of 7,500 square miles. The group lies in the tropics 176 east and 178 west longitude, and 15 and 20 degrees latitude. The two big islands Viti-levu and Vanua-levu, have exceedingly lofty ranges of mountains, and these have a most important bearing on the rainfall, which is heavy and frequent in the wet areas of the group, as well as saving from long continued drought the dry areas, there being about equal divisions termed wet and dry areas. The mountains too influence the climate of the islands, which is very moderate, and healthy, the death-rate of Fiji being the lowest in the wide world. White men and women 70 to 90 years of age are to be met in the islands, many of whom have lived there for 50 years and over.

The populations of the group are 4,000 whites, 85,000 natives, 61,000 Indians, 3,000 Chinese, and 3,500 half-castes.

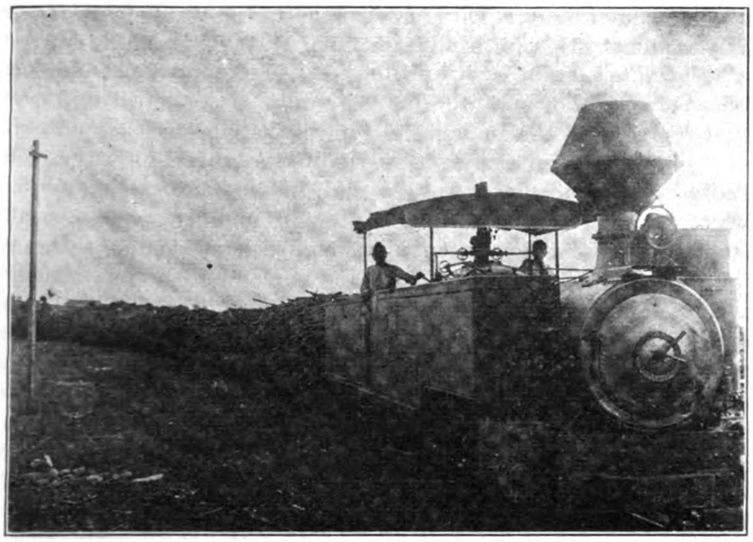
The trade of Fiji is now equal to 16 million (or 4½ million British money) dollars a year, but given an era of progress, unhampered by industrial unrest, and then a wide extension of development, the trade of the group should easily be in ten years equal to 100 million dollars a year. An important detail in the future prosperity of Fiji is the influence of the Panama Canal, this now gives Fiji a very definite central position in the South Pacific. Further there is the possibility of a federation of all British administered islands of the South Seas, with Fiji as the governing centre, should this eventuate and it is very likely within the next year or two, then Suva will become one of the three most important shipping centres of the Southern Hemisphere, Sydney, Australia and Auckland, New Zealand the others. There is the fact that the island's trade once altogether Australian, is now quickly drifting to Suva.

As a commercial asset the sugar industry of Fiji is worth many millions sterling. The group has sugar lands that compare most favorably with the best of all other sugar countries. In an estimate computed some years ago and taken from an old sugar journal, it stated that some countries produced five tons of sugar to the acre, and Fiji but three. Out of the 150 thousands of acres cultivated in Fiji to-day 85 per cent. of the acres can under experienced cultivation offer from four to five tons. Fiji lands too have up to date shown an extraordinary fertility, and vigor, and beyond the cane ash from the mills no other fertilizer is used. Fiji is recognized as one of the most valuable territories under the British crown, and on account of its wonderful sugar industry possibilities. The amount of sugar exported from Fiji in 1921 was less than other years on account of strikes by the Indian workers, nevertheless, it ran up to figures nearing 80,000 tons. Having comfortable labor conditions—the seasons can be depended upon the output of sugar this year should be about 100,000 tons, in another decade with reasonable conditions and a wider sugar cane area the supply should reach 200,000 tons.

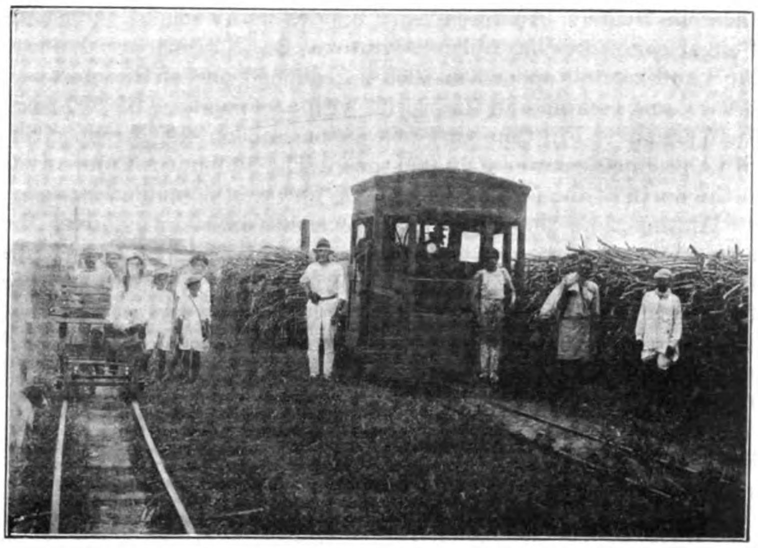
Sugar companies in Fiji have shown both courage and enterprise. There are some three companies, the Colonial Sugar Company, the Vancouver-Fiji Company, and the Melbourne Trust



The Colonial Sugar Company's "Lautoka" Mill in the Fiji Islands

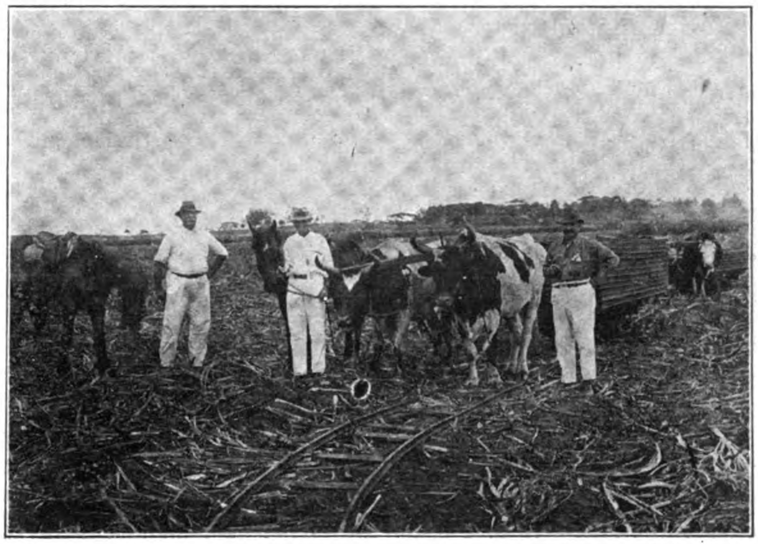


Sugar Cane Train on the Lautoka Plantation, Fiji. The Colonial Sugar Company operates over 200 miles of plantation railways in Fiji

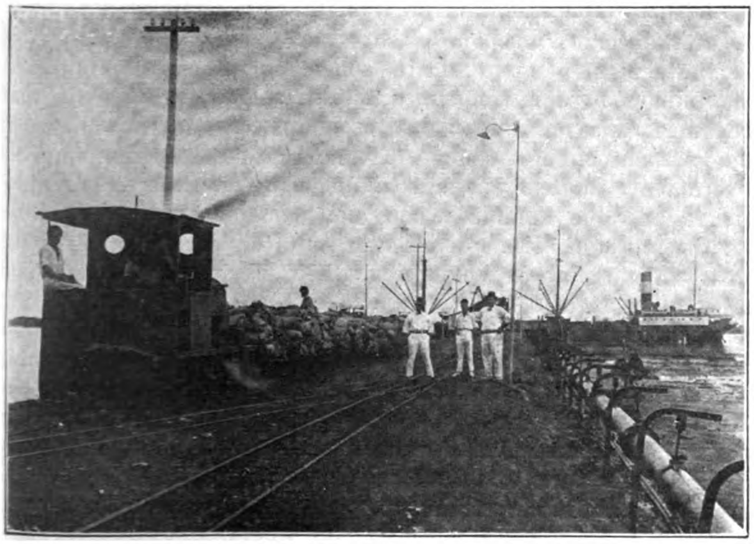


In the yard of the Vancouver-Fiji Sugar Company's Mill on the Navua River, Fiji

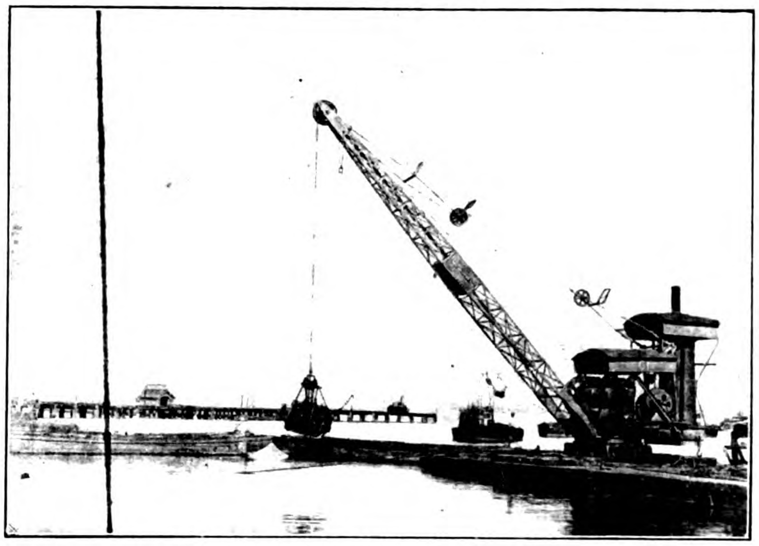
Collecting Burnt Cane, Uandi District, Fiji



Laying Portable Tracks into the Cane Fields, Fiji



The Wharf of the Lautoka Mill, Fiji, showing Molasses Pipes and a 7,000 tanker being loaded with Molasses

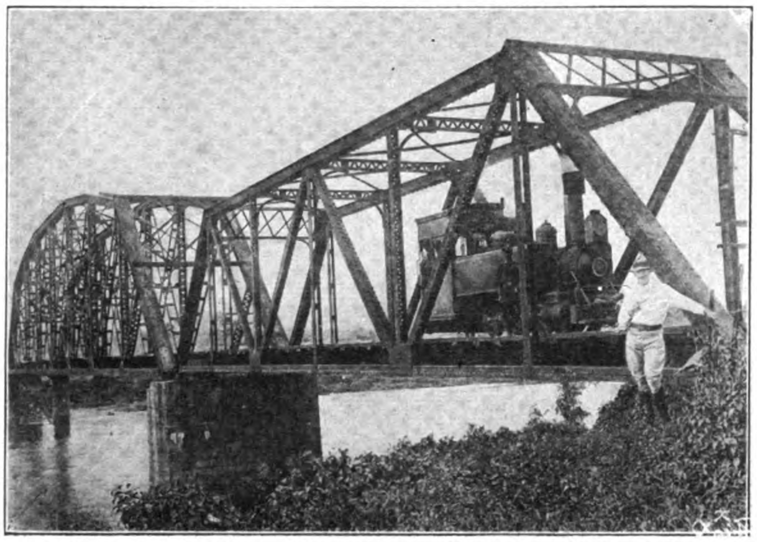


Reclamation Work in Suva Harbor, Fiji. All the foreshore is being reclamed for building sites

Company. The Colonial Company is a giant concern with its head offices in Sydney, Australia, and besides many ten of thousands of sugar cane acres has mills at Lautoka, Ba, Nausori, and Labasa. The Lautoka mill opened in 1903 is reckoned one of the most up-to-date, and complete in the world, with a capacity of 40,000 tons. The Vancouver-Fiji Company has a fine mill on the Navua river, with a producing power of 10,000 tons. The Melbourne Company is on the north of the island of Viti-levu, and is of a smaller capacity.

At one time there were several small mills dotted over the sugar areas, but present-day experience is for big capacity mills serving large areas, and fed by railways. The fluctuating price of sugar in the markets of the world makes it very evident that in order to attain success manufacturing of sugar must be conducted on large scale, large mills and large areas, small mills, and small areas these days cannot be made profitable.

While all companies may claim capable organization, the Colonial Sugar Company stands out as a master organization, it is one of the surest foundations for the continuance of progress in Fiji. From the smallest beginnings it has spread itself out a vast enterprise employing thousands of people, white, and black, and expending millions of money in outlay in mills, lands, and the settlements of its employees. It has a fine record of able management, of successful business, and above all of fair and liberal treatment of its workers. But in this last essential no company has received more unfair treatment from its Indian workers than the Colonial Sugar Company. No company has been more active in helping the Indians. Recently it placed at the disposal of the Fiji administration a sum equal to 400,000 dollars, to be applied in helping Indian planters of cane. This company like all others has given generously to promote happiness, and contentment among the Indians, in aiding the erection of schools, temples, and all Indian institutions. The question of labor then is the difficulty before the sugar companies, and it is the problem they are now considering. The labor is mostly Indian, and the problem is in their unrest and unappeasable discontent.



Bridge over the Navua River for the Plantation Railway of the Vancouver-Fiji Sugar Co.

Wives of Indian laborers employed by the Fiji Sugar Companies. Women and children wear necklaces of 25 to 50 gold Sovereigns

Some particulars of the Indians in Fiji will be informative and interesting. Forty-eight years ago they were introduced to the group, to help the whiteman's enterprises, then mainly cotton. They left India where starvation was their wretched lot in life, and they came to Fiji where opportunity for success beckoned the enterprising man on every side. When some years later the Colonial Sugar Company began its efforts, and the sugar industry was getting a firm footing, thousands of Indians came to Fiji under terms of indenture, terms that must have been agreeable to them, and which were not challenged by the Indian government of the day. The indenture system had faults of that there is no doubt but no reliable records show that the system conduced to callous treatment, or even harshness of the Indians employed. And there is the substantial proof of this that for over 30 years the Indians worked contentedly. There is also the indisputable fact that the Fiji administration faithfully and vigilantly watched the interests of the Indians, and that it was not possible to oppress them. Some ten years ago, however, the British empire was startled by reports that represented the Indians in Fiji as little better than slaves to the whiteman's enterprises, especially the sugar industry. The Indian government took action and Indian immigration to Fiji, which strange to say, maintained high numbers, was abruptly stopped. Commissions of enquiry were frequently employed studying the conditions of the Indians, and one and all gave satisfactory reports, all being unanimous in the opinion, "that under no circumstances could the Indians have been better off in India." The reports have now long since been amply proved as the insane imaginings of Mr. Ghandi and his party. An English missionary of the name of Andrews, and a man who have lived in India for many years, visited Fiji and reported the condition of the Indians as most favorable. A second time he visited Fiji, and then to the amazement of all pronounced the indenture system as the worst form of slavery, and the standard of the morals of the Indians arising out of the callousness of the system to be lower than the poultry yard. Mr. Andrews directed his charges mainly against the Colonial Sugar Company as the biggest employer of Indian labor. Andrews charges immediately brought the administration and the white settlers to an united action and the result was the charges were shown to be pure exaggerations, founded in pique, Andrews not having any official authority for his investigation did not receive the facilities and reception he thought he was entitled to. He, however, received much hospitality and kindness especially from the white sugar planters and the officials of the sugar companies. The Indians by this time fully appreciating the knowledge that they were receiving a great deal of sympathy, and that unrest in India was becoming a source of anxiety to the British imperial government, suddenly assumed a menacing attitude to the white settlers and the administration and demanded racial equality, and the fullest political priveleges. Agitators arrived from India, mostly in the guise of religion, and their efforts were so quick and successful that before they were found out, the Indians of Fiji were rebellious, they were deliberately aiming for the overthrow of British rule, and the ousting of the whiteman. Strikes lasting for months were used to block and destroy the whiteman's enterprises. Failing in this to the extent they hoped for they broke out in riots notable for bitterness and savagery. Then firm administrative action was taken, troops were brought from a British dominion, and Indian ambitions for supremacy in Fiji were ended. indentore system was abolished, and representation was given the Indians in the Fiji general parliament. But these palliatives had not the effects expected. The morals of the Indians remained

as low as ever, crimes with them were as frequent as ever, and these conditions remain though the indenture system has ceased for over two years. All wage and living conditions in enterprises were improved with them in the hope they would be satisfied. But they remain sullen, they demand racial equality, all political privileges, and the sugar workers ask for 2 shillings an hour, equal to 16 to 18 shillings a day's work. In their sullenness they decided no matter what happened they would as a matter of religion call a strike to last six months. With fanatic perseverance they carried out the strike, the sugar industry suffered a set-back, but the Indians are at the moment realizing they have made a terrible mistake. The sugar industry is employing hundreds of Fijian natives in their place who are proving willing and capable. Then there is afoot an agitation to repatriate the Indians and get there reliable Chinese in their place. The sugar companies too are showing an independence the Indians little expected. One sugar company has given notice its mill will close until the high price of cane demanded by Indian planters is reduced, and the wages asked by Indian workers are brought within those reasonable limits leaving some margin of profit for the company. All other sugar companies threaten to follow suit, and the Indians are confronted with the proposition of being repatriated to India, back to starvation and misery. What will be the result one is not at present able to foretell, but this is very evident that if Chinese labor can be brought to Fiji, it will mean a new era of prosperity for the group. The majority of the white settlers will be glad to see the end of the Indians, whose unreasonableness is beyond all comprehension.

What is so remarkable in all this turmoil is the prosperity of the Indians. The following details will be enlightening as showing how well the Indians have done in Fiji. Some of the richest men of Fiji are Indians, some sprang from the ranks of the indentured labor. Every Indian settlement of Fiji is notable for its ever-increasing population, these settlements are crowded with children. There are 12,000 individual Indian land-owners in Fiji, owning 125,000 of the richest acres, and valued at £750,000. An interesting evidence of the wealth of the average Indian in Fiji is demonstrated in the jewelery worn by the women and children, and sometimes by men. It is quite a common thing to see gold and silver ornaments to the value of 400 dollars or more on a woman. Tiny children playing in the gutters sport necklaces of gold sovereigns, Australian currency. Every family owns its land, its cow, its horse and sulky. There are many motor cars in Fiji, and majority are Indian-owned. In five vessels leaving Fiji for India, between the end of 1920 and the beginning of 1921, there traveled 4,751 adults, and 1,960 children, mostly born in Fiji, having remittances equal to £196,389, jewelery equal to £31,891, and cash in hand £8,054. These are the people who going to India proclaim the territory a land of slavery. And yet these are the first, the moment they are robbed of their wealth, a frequent occurrence in India, friendless and penniless, they cry out to be sent back to Fiji.

What is one of the most remarkable admissions of the untruthfulness of reports of ill-treatment of Indians in Fiji is the fact that the Indian government has since last October permitted immigration to Fiji, and to-day the Indians are flocking to the group.

For the moment the future of Fiji is obscured in the problem of the Indians, but nothing is more assured that given reasonable conditions of labor, Fiji will soon be one of the most important commercial territories of the Southern Hemisphere. The factor that guarantees this prosperity is the continuance of the sugar industry.

Nantungchow Automobile Service

SINCE new motor roads has been completed in the various villages of Nantungchow, a company has been established to operate motor services.

Changsha-Ningshang Automobile Road.—Messrs. Tao Chung-chien and Liu Keh-chia have obtained sanction from the provincial government of Hunan to organize a company with a capital of $500,000 to build an automobile road from Changsha to Ningshang and operate autobus service there. Some Americans have proposed to construct a road starting from Changsha, passing through Yih-yang, An-hua, Sao-poo and Tze-kiang, thence to Hsiang-dan via Wu-kong, Pao-ching and Hsiang-hsuan and leading to the newly-built military road in Hunan, with a total length of 2,661 *li*, with "famine" labor. The work will cost $2,000,000, of which $1,200,000 will be appropriated by the Chinese and foreign famine relief committee and the balance raised from other sources. A number of Americans in Peking have supported the proposal and the U. S. minister is said to have approved the scheme.

Autobus Services in Shansi.—Up to the present, four automobile roads recently built in Shansi have been opened to traffic under the jurisdiction of the provincial road administrations, viz., the Taiyuanfu-Tanhsien line, in the north, the Taiyuanfu-Lingshih line in the south, the Taiyuanfu-Fenyang line in the west and the Taiyuanfu-Pingting line in the east. The Tsing Yih Autobus Service Company, Ltd., is being organized at Taiyuanfu, Shansi, by Mr. Sung Hai-hsu to operate an automobile service on the South Shansi road with six freight and four passenger cars. The Tsing Pei Autobus Service Company, Ltd., Taiyuen, Shansi, is raising capital in Fengyang for purchasing cars to operate on the roads leading to western Shansi.

Yunnan-Kwangsi Automobile Transportation Company.—The Yunnan-Kwangsi Automobile Transportation Company, Ltd., is being organized at Yunnanfu with a capital of $5,000,000 in 500,000 shares of $10 each. The motor road to be built by the proposed company is to start from Quan-yang, Yunnan, passing through Yu-chee, Kiang-chuen, Tung-hai, Kien-sui and Koo-ju, connecting with the Kooju-Pichaoshan Railway, thence to Pan-suh, Kwangsi, via Wen-shan, Kwangnan and Po-yih. Three branch roads have been mapped out leading to Zih-wu, Shih-ping and Wen-shan respectively.

Anking-Liuan Automobile Road.—An automobile road is to be built from Anking, Anhwei, to Liu-an, Anhwei, viâ Dung-cheng and Wai-ning by Messrs. Wang Li-yuan, Sha Hsiang-chang and Wang Shaio-shan in order to operate an autobus service. The actual work will be started in about two months when the capital is expected to be subscribed.

Road Construction, Southern Kiangsi.—It is reported that Mr. Chow Wei-kong, chairman of the road construction bureau of Kiangsi, has secured a loan of $3,000,000 from a foreign firm in Shanghai to construct the projected roads in southern Kiangsi.

Industrial Notes

MATCH FACTORY, KIRIN.—A match factory is to be established at Tungkwan, Kirin, by Mr. Sun, manager of the Hun Man Flour Mill.

MUKDEN COTTON MILL.—The Mukden Cotton Spinning and Weaving Factory promoted by General Chang Tso-lin is inviting tenders for the erection of a new factory building.

FLOUR MILL, SHONG-CHIU, HONAN.—A flour mill to be capitalized at $240,000, is being organized at Shong-chiu, Honan, by Mr. Liu Sze-kiu, manager of the Hun Foong Coal Company.

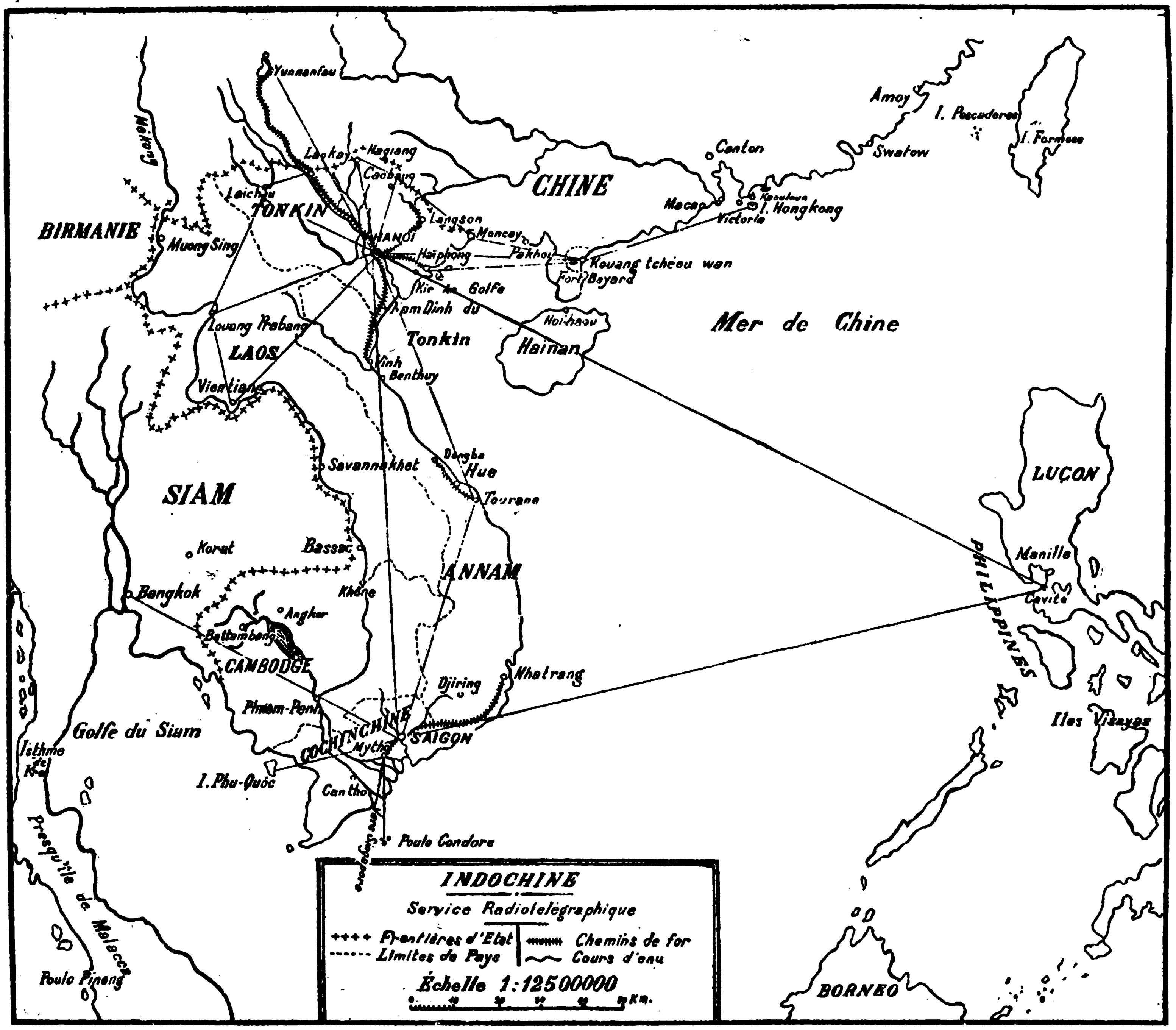
ICE PLANT, CHUNGKING.—The Woo Foo Ice Manufacturing Company is being promoted at Chungking, Szechuan.

FLOUR MILL, PAOTAO.—The Pao Foong Flour Mill is being organized at Paotao by ex-premier Chien Nun-hsiung and several others.

CANTON BUILDINGS.—The Canton authorities are contemplating the sale of the lot of land at Tung-kong-sing-hu for $700,000. Of this, $300,000 will be spent in erecting a magnificent town hall and a library, $200,000 for offices for the various departments and bureaus, $100,000 for a school, and $100,000 on a hospital.

GLASS FACTORY, NANCHANG.—A glass manufacturing company to be capitalized at $400,000 is being organized by Messrs. Li Shiao-chou and Wang Cheng-chien at Fu-kien, Kiangsi.

The Radio System of Indo-China



(L'Evcil Economique de Indo-Chine)

THE radio telegraphic system of Indo-China inaugurated under the administration of M. Sarraut and developed by his successor, Governor-General Long, consists of 15 stations, including the two at Cat-Ba and Kien-An, which are also equipped with special apparatus to facilitate navigation during heavy fogs at the entrance to the Haiphong River. The general system is divided into three secondary systems: (a) Tonkin system; (b) Laos system; Cochin-China system.

The Tonkin system comprises the following stations:—Hanoi, Kian-An, Cat-Ba, Moncay, Caobang, Hagiang and Laichau. From Kian-An or Moncay, communication is had with Fort Bayard at Kwangchow-wan, which is in communication with Hongkong. Moncay, Caobang, Hagiang and Laichou, all frontier posts, intercommunicate and connect with Hanoi and are able to give immediate notice of the movements of the pirate bands which infest the coasts or the bandits which flit back and forth over the Kwangsi border. Upon the coast station at Kian-An, in addition to its connection with Fort Bayard and ships at sea, devolves the duty of transmitting the standard time.

The Hanoi station of 25 kilowatts capacity is equipped with the best high-powered apparatus and communicates with Yunnanfu, Tourane, the Laos stations, and Saigon, and is to be enlarged for a rapid public service with Saigon. The coast station at Tourane is maintained for communication with vessels and to transmit the meteorological bulletins.

The Laos system has stations at Luang-Prabang and Vientianne which intercommunicate and connect with Hanoi. The Cochin-China system comprises the stations at Saigon, Mytho, Phuquoc and Poulo Condor. The Phu-tho station at Saigon which as yet is only a secondary station, but which is to be equipped as a first-class station within the year, now communicates with Hanoi and other countries through the station at Bangkok in Siam and through the Manila station with San Francisco. The Mytho coast station is in communication with ships and with Singapore and transmits the Havas News telegrams and the meteorological bulletins twice daily. A permanent service has been assured since July of last year between the three coast stations of Mytho, Tourane and Fort Bayard. Indo-China receives every night from the Bordeaux Central Wireless Station in France full market and exchange reports and the news of the day.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, MARCH, 1922.

Reaping the Whirlwind

ONCE again it devolves upon the responsible authorities of Shanghai to invite attention to dangers which menace the vital interests of the port. It will be recalled that in his last annual report on the trade of Shanghai, the commissioner of customs gave as a reason for the recent business panic the great influx of foreign firms during the preceding year whose inexperience and plunging precipitated the calamity. This, in turn, was due in large part to the irresponsible campaign carried on by over zealous "griffins" who rode into local popularity on the wave of anti-Japanese sentiment and capitalized this to the full in their agitation to induce new firms in the United States to open offices in Shanghai. In this cockpit of conflicting national interests, it is difficult at times for newspapers and other defenders of the public welfare to speak as plainly as they might had they only one national interest to cater to. Shanghai paid, and paid dearly for a propaganda that would never have been tolerated in a united community.

In the same manner as the ground was prepared for the last catastrophe so the way is now being prepared for a greater one through the irresponsible and reckless propaganda of bolshevists, student politicians and the activities of foreign organizers and sympathyzers. In the December number of THE FAR EASTERN REVIEW we reprinted extracts from a recent report of the U.S. department of labor on "Labor Unrest in China," which invited attention to the "precariousness of a situation. aggravated by bolshevist propaganda."

"Sporadically, radical doctrine had crept into university lectures; but its penetration into Chinese industries was not definitely manifested until the ninth anniversary of the Chinese republic, October 10, 1920, when the bolshevik agents in Shanghai issued circulars informing their Chinese comrades: (1) That the Peking government, being in the hands of the capitalists, was oppressive to the masses; (2) that in bolshevism the workers would find the only object worth living for and (3) that the people of Russia had already achieved this object after three years' vigorous struggle. Quietly and steadily this force has been gaining a foothold in the rank and file of labor. In February 1921 the Chinese chargé d'affaires in Denmark, who was then well informed on the Russian situation, advised Peking of the broadcast propaganda of the Moscow society in Tientsin, Shanghai, Hankow and Canton. A few weeks later Peking residents were startled by motor cars flying a red flag with a star and the letters F.E.R. (Far Eastern Republic). Thereafter the Chinese government felt it necessary to take precautions against lectures on communism and *pseudo* welfare speeches delivered at mining camps and industrial centres ostensibly for the benefit of the workers."

The business man, however, sees nothing and cares less about matters which does not affect his immediate prospects or profits. Under his very nose an agitation has been skilfully carried on under the cloak of Chinese patriotic uplift in some form or other, now as a protest against the proceedings of the peace conference at Paris, now as a national boycott against Japanese goods over the Shantung award, again as a protest against the Anglo-Japanese alliance and the menace of a boycott against British goods if the pact was renewed, in manifestations against the proceedings of the Washington conference, in the seamen's strike at Hongkong with its communistic tendencies and the perturbed labor conditions in Shanghai, with the possibility of further disorders arising from dissatisfaction over the results of the Pacific conference. It is all part of a set plan, the attempt to create a super-government in China, thats in the end will overturn the existing regimé and bring the agitator, into power.

When these agitators or their mouthpieces assume to stand for organized public opinion in China. the business man takes it all for granted. The foreign merchant in fact, the world at large, would be surprised to learn that the telegrams ostensibly emanating from Shanghai menacing the peace delegation at Paris and signed by at least a hundred chambers of commerce, guilds, student bodies and peace societies, were written in Peking and mailed to Shanghai to be there placed on the cable in order that the Shanghai date line would give weight and verisimilitude to the formidable array of signatory senders.

We recall one of these cablegrams which made a most profound impression upon the Chinese delegates in Paris and on the delegates and journalists of other nations to whom its contents were disclosed. It read:

Loutsenghsiang, Kooweichun, Wuchaochu, Wangchengting, Chinese Delegation, Paris.

"People of China rising to true representation through their merchants associations, students federations, guilds and organizations of all classes of citizens, have voiced entire nation's disapproval of transfer of Germany's former rights in Shantung to Japan. Signature of peace treaty without reserved understanding that subsequent questions of Germany's former rights or of Japan's succession to such rights in Shantung will be decided according to principles of international law and equity, will not be recognized as binding upon Chinese people. If such reservation is not formally acknowledged by other powers, treaty must not be signed. Any action contrary to these instructions will force people to repudiate delegations signature as unrepresentative and to hold delegation and government responsible for inevitable loss of national rights. Resignation of delegates at this time will be considered as evasion of responsibility." Signed by United Chambers of Commerce, 38 Students' Federations, 25 Educational Associations, 23 Christian Societies, 4 Returned-Student's Unions, Bankers, Silk, Tea, Linen and Laborers' Guilds, 3 Peace Societies.

Is it any wonder that in face of such a telegram that the Chinese delegates to the Paris conference refused to sign the peace treaty without reservations, or that they were so long a time returning to China? Is it any wonder that the American delegates and others who were permitted to read these instructions were impressed with the growth of public opinion in China and feared to go contrary to it?

The success of this experiment in creating a super-government through the medium of the press and the free use of the cable, convinced its authors how easy it would be to repeat it whenever the occasion required, and we find the same tactics resorted in the summer of last year by holding out the menace of a boycott against British goods if the alliance with Japan was renewed. Telegrams bearing the signatures of chambers of commerce, students' associations and other Chinese bodies were dispatched broadcast to members of parliament, the British cabinet and to prominent personages and bodies in America, all carrying the veiled threat of what would happen unless the demands of China were complied with. It also went over. It was anti-Japanese, therefore popular.

It was all so easy. The success attending the first attempt to wield the weapon of a manufactured public opinion resulted in its revival in order to prevent the renewal of the Anglo-Japanese alliance. Telegrams signed by eighteen guilds and students bodies were dispatched to the British parliament and cabinet protesting against the alliance and conveying the threat that unless China's demands were complied with, a boycott would be declared against British goods. It was the same old trick, employed in the same old way, by the same minds that engineered the anti-Japanese campaign at the time of the Paris conference.

Unchecked, unhampered, emboldened by success, the system of intimidation spread. The Hindoos learned well the lesson taught them by the passive resistance of the Chinese, and unless all reports that come to us are exaggerated, the British have paid the price in India for the example set in China. They have paid

the price in Hongkong, and unless signs fail, we may dance to the tune of the red piper in Shanghai unless a saner view is taken of these recurrent political agitations.

Is the picture overdrawn ? Read the following extracts from the report of the police commissioner of Shanghai and draw conclusions :—

"The spirit of unrest, or of self-expression, noticeable during recent years continued during 1921. Various movements were in evidence ; among them being the opposition to the licensing of rice shops in July, different agitations by street unions, objection to the raising of rents, meetings in connection with China's cause at the Washington conference, Chinese representation on the municipal council, activities of socialist extremists and strikes. Other matters of special public interest to which the police are giving attention include the new produce and stock exchanges and light weight copper coins.

"The reaction on the Chinese people brought about by disappointed hopes was seen in May 1919 when the decision concerning Shantung at the world peace conference led to a general strike in Shanghai, which lasted for three days, and was only settled through the central government dismissing three of its most prominent officials. Bearing in mind the serious consequence which the reaction produced for the central government on that occasion, propagandists of certain interested politicians have for some months past been filling the Chinese minds with accounts of the great things to be expected from the Washington conference.

"A danger exists that the people, forgetful of what transpired in the past, will once again permit themselves to be gulled by the activity of these propagandists. As early as last August these parties began the distribution of leaflets advocating the abolition of extraterritoriality. This propaganda was followed by meetings of local bodies at which resolutions dealing with various phases of China's alleged wrongs and desires were passed and telegraphed broadcast. The most recent meeting, at which about 6,000 people were present, took place on a piece of vacant ground near the Shanghai-Hangchow Railway Station on December 8 when it was suggested that telegrams be sent to the Chinese delegates demanding the cancellation of the twenty-one demands and the unconditional return to China of Tsingtao and other rights and concessions in Shantung. These proposals, however, were not put forward, as strong opposition was raised by a prominent member of the Hupeh reconstruction society, and the chairman of the national organizations union of China, who pressed for the inclusion of a demand for the non-recognition of the Peking delegates. The same resolutions, including this demand, were, however, brought up and passed at a second meeting held by some forty-five persons behind closed doors in the premises of the national Chinese students' union, and the telegrams were dispatched. Following upon this the entire student body and other societies announced their disapproval of the attempt to prejudice the position of the Peking delegates and have since emphasized their opposition by resigning from the national citizens diplomatic federation, the organization which had taken the lead in sending off the wires.

"The audiences at the several meetings held up to the end of the year in connection with the Washington conference consisted for the most part of youths, professional agitators and idlers. It would not be correct to assume that the resolutions passed at these meetings at any time represent the opinions of the Chinese people. In China, however, where the masses to a great extent are swayed by the few, this agitation may produce quite unexpected and dangerous results. It may revive (among the masses) that never extinct spark of anti-foreign feeling and cause an uncontrollable conflagration which will be fed by the usually untruthful and biassed propaganda which has been scattered broadcast by disgruntled politicians and others."

The police commissioner has given voice to a truth that no foreign newspaper in China or foreign press correspondent cared to dwell upon. "*It would not be correct to assume that the resolutions passed at these meetings at any time represent the opinions of the Chinese people.*" He then points the danger, the menace that has been growing under our nose for over two years. The police commissioner gives official corroboration to evidence that has been in our possession for a long time. The warning of the police commissioner will fall on deaf ears. There are too many national interests catering to the Chinese who tremble and fear for the good-will of the guilds and other bodies whose names are so freely employed to give prestige to the agitators and their work. Any movement masquerading under the cloak of Chinese patriotism or uplift is safe from foreign condemnation or criticism.

The police commissioner of Shanghai is not an alarmist. The picture he paints is not unreal. The Chinese have been trained and led by foreigners in their manifestations against Japan and Great Britain. They have been encouraged to boycott Japanese goods, while highly placed foreigners have publicly advised their countrymen to hurry and skim the cream off the Chinese trade. They have been educated to strike, demonstrate, hold meetings, send out menacing telegrams to foreign governments and black-jack their official delegates into accepting their viewspoint under penalty of having their ancestral tombs desecrated. They have been taught to attack the foreigner in his vulnerable point, his pocket-book. The example has spread to India, to Hongkong.

The agitators have mobilized and manufactured Chinese public opinion through pressure on chambers of commerce, students associations and other bodies, and held the rod over foreign governments and conventions. Yet at no time have they faithfully represented the great mass of Chinese.

We have been solemnly told that Bolshevism could gain no foothold in China, that the peaceful, democratic, docile Chinese would reject the teachings of Lenin; anti-Japanese writers have frothed at the mouth in denouncing the unwillingness of Japan to evacuate Manchuria and Eastern Siberia because of her fear that the red terror would find its way into China and Korea. Well, the picture is before us. The strike at Hongkong bears all the earmarks of a communistic plot. The police commissioner of Shanghai whose business it is to ascertain the inside facts surrounding disturbances in the settlement, has spoken.

The police commissioner is right. The agitators and the propagandists have pulled the wool over the eyes of the foreign community in China and through their foreign press connections, have fooled the entire world. They have educated the Chinese proletariat, the masses of unthinking, easily-led workers, into dangerous ways. Having learned their lesson, we look may forward to the inevitable consequences. As we sow, so shall we reap.

The Craft Guilds of China

By Ta Chen, U.S. Gov't Department of Labor Report

THOUGH the labor union, being an importation from the West, is yet limited in scope and influence, the craft guild penetrates every important trade in the country. A correct understanding of this powerful organization may therefore be a long step toward comprehending the industrial background of modernized China.

Two instances will give in a nutshell the tremendous power of the guild organization, past and present. In 1883, a dispute about tea export at Hankow (Hupeh) became acute. The foreign traders accused the Chinese merchants of showing false samples. The Chinese made the countercharge that false weights had been used. Whereupon the foreigners decided to stop buying, and the Chinese accepted the challenge by stopping sales. The tea markets in London rose steadily, but no tea could be bought at Hankow, and no coolie would work for the foreign concerns. A strike had been declared by the guild, which both the merchants and the coolies obeyed most strictly. Consequently, the foreign traders lost an enormous amount of money in the export trade.

Though it has undergone material changes, as shown elsewhere in this paper, the guild of to-day is no less powerful. The salt merchants of the Yangtze valley, including the provinces of Anhuei, Kiangsi, Hupeh and Hunan, were in the past required to deposit money with the bureau of salt producing and transporting merchants. Instead of immediately paying the money to the producers, the bureau usually retained it indefinitely and deposited it in banks of questionable financial soundness to draw interest, thus causing great inconvenience both to the merchants and producers. After repeated protests, the bureau was abolished and a new one established in its place. On hearing of a proposed revival of the old bureau last August, the guild of the salt merchants immediately threatened a strike, which, had it not been prevented, would have cut off the salt supply of the whole Yangtze valley for some time.

Organization.—The craft guild varies with various trades and different cities. For brevity's sake, the tea guild of Hangchow (Chekiang) is here taken as a type. The manager is elected annually. With him are slso elected 12 committeemen, all of whom serve without pay. Each of the committeemen takes charge of the guild for one month, thus keeping the chairmanship in rotation. The executive secretary is the only paid officer in the organization. Finding that the rotation system, though basically democratic,

has worked to increase irresponsibility and division of powers, the tendency to-day is toward the concentration of executive control in a committee of three, to be responsible for the work of the guild the year round. In some guilds the number of salaried officers is also increased.

Any firm wishing to join the guild must pay an initiation fee of a certain sum, that of the Hangchow tea guild being $300. The member firm is then required to obey the regulations of the guild, some of which follow: (1) That no member firm is allowed to accept from or give to customers any rate other than the guild rate; (2) that no member firm is allowed, through underhand dealings, to cause loss to a fellow member firm and (3) that no member firm is allowed to antedate or postdate drafts. For any violation of these important rules, the firm is fined. In the case of defamatory acts of a more serious nature, a general meeting of all the guild members is called, and the guilty firm is, by vote, expelled from the organization.

Membership.—The firm is a corporate member of the guild. For ordinary guild meetings, each firm sends its representatives. The firm is composed of masters, journeymen and apprentices. The masters and journeymen are members of the guild, whose vote is required in such important matters as a common boycott. Though early initiation is possible, the apprentice becomes a member only after he has served his term of apprenticeship. The young craftsman is then a journeyman, and in that capacity he stays for two or three years. Professional courtesy and loyalty to his master impel him to serve first his master, with regular pay, before offering his services to others.

The masters and journeymen usually work in perfect harmony. Should there be friction, the journeymen hold meetings at a Chinese tea house and then make representations to the masters. As they are very helpful in the trade, their complaints receive careful consideration and are usually settled to their satisfaction.

More by custom than by guild laws, girls are prohibited from learning a trade. In the Bankers' Guild of Wuhu, this limitation is explicitly stipulated in the regulations. The only place where the girls are preferred is the needlemakers' guild. This is apparently due to women's aptitude for needle-eye drilling, an art requiring much precision and patience. To-day, however, girls have more trade opportunities, as shown by the fact that 56,000 woman employees practically monopolize the work of the silk-reeling industry in Shanghai.

Authority.—The craft guild is the unifying and controlling agency of a particular trade. Its word is law. It standardizes weights and measures. Keeping close watch of market changes, it issues a rate, usually daily, which must be accepted by all the members and the buying public. Rate-fixing power is given to the guild primarily to eliminate cut-throat competition by the members. When the guild system works normally, underbidding and underselling are not common, unless done in an underhanded way. Small merchants are not put out of business by unfair competition on the part of the more influential ones in the trade. The industry is thus stabilized.

Disputes arising between members are usually first referred to the guild for settlement, when the manager and the committee sit as judges, with two or three experts as advisers. In the early days, the failure to appeal first to the guild might result in the revocation of judicial protection to the member: "It is agreed that members having disputes about money matters and other important matters shall submit their case to arbitration at a guild meeting, where every effort will be made to arrive at a satisfactory settlement of the dispute. If it is impossible to arrive at an understanding, appeal may be made to the civil authorities, but if the complainant resorts to the court in the first instance without referring to the guild, he shall be publicly reprimanded, and in any future case he may bring to the guild, he will not be entitled to redress." To-day no such rigidity exists. The contestants are given the option of choosing between the court and the guild for the first appeal for settlement of any dispute. This change has come about mainly through the extension of governmental functions. In the past the government of China seemed to assume the *laissez-faire* attitude toward commerce and industry. After paying the taxes, the merchants were left entirely free. For the protection of their own interests, the guild undertook to formulate laws to regulate trade. In time, custom and tradition grew, and the craftsmen voluntarily submitted themselves to the jurisdiction of the guild. Of late, the state has promulgated trade acts and mining laws, and has employed experts to adjudicate industrial suits. Nowadays, the court as well as the guild may be appealed to as the tribunal of the first instance. But, owing to the craftsman's inability to pay the lawyer's fees and his aversion to legal technicalities, the guild is often preferred.

Income and expenditure.—The income of the craft guild comes from five main sources: (1) The initiation fee paid by the member firm at the time of joining the guild, as shown in the case of the Hangchow tea guild. (2) Donations by wealthy members. Twenty-five per cent. of the reserve fund of $850,000 is from private endowments. (3) Fines. The bankers' guild of Wuhu requires each member firm to deposit 100 taels as a guaranty fund against fines for violations of the guild rules by that firm. (4) Commission fee paid by firms from sales. The timber guild of Ningpo assesses its members according to the amount of their sales, averaging one-tenth of 1 per cent. on the turnover. (5) Fees from masters and journeymen. The Han Yang guild at Ichang provides that workmen, such as tailors' or carpenters' hands, pay 30 cash (about 13 cents gold) per month; their masters, if keeping no account books, are also assessed at the rate the guild sees fit; and clerks pay 2 per cent. per annum on their incomes.

Broadly stated, the income from the first three sources is for the permanent maintenance of the guild, and the income from the last two is for its current expenses. Other important items of the guild's expenditure cover the following: (1) The guild gives financial aid to sick members, and also to those who are temporarily unemployed. (2) The guild gives charity to the families of the poorer members. (3) The guild holds religious or social festivals several times a year. (4) The guild pays a government tax.

As above stated, the most important activities of the craft guild are threefold, relating to (1) the trade in general, (2) the member firms and (3) the masters, journeymen and apprentices. To illustrate its workings, the bristle guild of Shanghai is selected as an example. The bristle export of China for the year 1917 amounted to 64,181 piculs and 6,171,638 Haikwan taels. One of its largest member firms employs a manager, who receives a monthly salary of $100, an assistant manager who receives half that much, a chief foreman, who receives $30, and a number of foremen, who receive $20 each. The workers are paid by piecework, and are on a contract basis. They average about 35 to 50 cents a day. Twelve hours constitutes their workday.

The organization of this guild is one of the most up-to-date, and its regulations, of which the following are the main provisions, are typical:—

Both long and short bristle, if prepared by the ordinary method, shall be sold at the guild rate and no other. Bristles specially prepared or imported from other cities shall be sold at special rates to be fixed by the guild committee and the agent of the firm.

No member firm is allowed to accept from or give to customers any rate other than the guild rate.

Every master must, before commencing his work, purchase a certificate from the guild for $5. Masters from other cities, if in financial difficulties, may work for a month before purchasing the certificate.

Each master is allowed to take not more than one apprentice at any one time. After the completion of apprenticeship, the apprentice must work for the master as journeyman for at least two years before he himself takes in any apprentice.

The master shall be paid once in every 10 days. Fifteen cents are taken from every dollar to defray the current expenses of the guild.

There shall be a uniform system of weight, and that of the guild shall be adopted.

Drinking and gambling are prohibited.

All disputes arising between workers and employers shall be submitted to the guild for settlement. There shall be no strike pending a settlement.

The Craft Guild's Influence on Chinese Indutries

The honesty of the Chinese in business dealings has become proverbial among Americans. In a large measure, business honesty is developed in the guild organization. " One price " for one grade of goods must be strictly observed by all the members. A free exchange of promises between the promisor and the promisee, for a consideration, is always binding on both parties. The craftsmen, by mutual agreement, strive to turn out faultless work. Equity prevails, efficiency is obtained, and industries prosper.

Large-scale combination has protected the craftsmen and the coolies from oppression by the landed aristocrats and political demagogues. As early as the T'ang Dynasty (618-906), heavy taxation and the impressed labor act forced the poor to leave their homes secretly in order to evade the taxes, and in doing so they permanently lost their small holdings. Toward the end of the House of Sung (960-1279), vargrancy was phenomenally increased. In late years, the floating population has been an exploited class of manual laborers and skilled workers. The guild has acted as their fraternal protector. Even to-day some guilds pay about one-third of the court fees for the member who institutes a law suit and has a good cause of action.

In no small degree the guild has saved Chinese trade and labor from being crushed by the powerful foreign merchant. Facing a common competitor, the tradesmen and the coolies stand firm. Protesting against a grievance, the laboring classes unhesitatingly follow the decision of the guild. The foreigner has succeeded in exploiting China only by the incessant influx of capital, and the natives have maintained their industries largely through organization.

But here praise must stop. The guild, as a unifier, has greatly hindered freedom of action, and prevented the making of " industrial captains." A man of perspicacity and shrewdness finds little expression for business initiative. He is confronted with two alternatives : He must either blindly follow the guild regulations, or suffer a common boycott for exercising his creative intelligence and violating rules.

There has never been a national guild, the boundaries of the province limiting its furthermost development. Interprovincial competition by guilds has caused tremendous waste in production and retarded the growth of industries on national lines. The rice-milling industry is a favorite battlefield of the " Kwantung gang " against the " Hupeh gang " for capital and labor. Regional bias is carried to the extreme, and closer co-operation rendered impracticable.

Conclusion

The old and new phases of industrial life in China have here been sketched. The craft guilds have been efficient protectors of the skilled and unskilled workers from economic exploitation by capitalists and politicians. China is emerging from handicraft, and to-day the labor union is gaining ground. During this transitional period, various socio-economic factors have aroused the workers to strive for their rightful place in the industrial life of the country. This is clearly seen in the present unrest.

Finance China's Highways

The Way to Assist the Automotive Interests

AUTOMOBILE manufacturers are more and more turning their attention to the development of Far Eastern markets where the building of new roads, opening up virgen territory to commerce, offers a vast field for the sale of trucks and passenger cars. The rapid expansion of the automotive industry during the war with an unprecedented prosperity and purchasing power amongst the working and middle classes, taxed the capacity of the manufacturers to the limit, with the result that plants were unduly enlarged and many new companies created. With the slump, the conditions of the automobile industry have gone from bad to worse, the demand falling off in America to half the production capacity. The American market has reached a point of saturation and foreign markets must be developed if American plants are to be maintained at their present high state of efficiency and production. Approximately two and a quarter million cars can be turned out yearly by American factories, and of the present output only about eight per cent. are being exported. These conditions have brought home forcibly to the American automotive interests and their government which derives a huge revenue in taxes from these sources, the necessity of increasing exports in order to bring production more nearly to normal.

At the request of the national automobile chamber of commerce, the department of commerce has sent Mr. William L. Irvine a special expert to the Orient to investigate and report on conditions in Japan, China, Philippines, Siam, Indo-China, Malay States and India. American manufacturers consider that the Oriental market is capable of much greater expansion, and are prepared to do everything within their power to accelerate this development.

It may be said that the expansion of Far Eastern markets for automotive products, as in all other parts of the world, will go hand in hand with the construction of good roads, and whatever can be done to encourage and facilitate this desired end, should be carefully studied. In Japan, the government and its leading financiers are already working out a national system of new roads to connect the ports with the manufacturing centres, and the various provincial and municipal governments are appropriating huge sums each year for their construction.

In all countries of the Far East, with the sole exception of China, the various governments are appropriating increasing sums yearly for the construction of new roads, and a constant and steady development is the result. China alone, the greatest market of all, lags behind, with an empty treasury and no definite plan. There may be many ways whereby the automotive markets of China can be developed without outside financial assistance, but we are of the opinion that if any great expansion is to be realized, it can come only through some redical modification in the policy of the consortium powers which will enable foreign financial markets to come to the assistance of China.

The consortium policy is primarily a railway policy. It could not have been otherwise, as its fundamental function was to eliminate spheres of influence and harmonize the conflicting interests of the powers as expressed through their railway contracts, concessions and rights, which delimited these spheres. If the future railways of China are to be profitable, road construction must go hand in hand with their development, and provision made for advancing funds for that purpose. Or, as we pointed out in our special Automotive Number, issued in January last, a special financial institution should be created that could work with and through the more reputable Chinese banks in providing funds for road building.

A glance through the Automotive Notes in this section, will disclose that the Chinese are doing their best to construct new roads and create markets for mechanical transportation, but this is not enough to meet the demands of the foreign automotive industries compelled to seek export business to save their plants from deteriorating. A highway loan to China of say $100,000,000 would build 20,000 miles of new roads, and provide a market of for automotive products which would soon exceed the original investment.

At the present rate of road construction in the Federated Malay States, Siam and Indo-China, it will not be long before it will be possible to motor over metalled roads from the Chinese frontier town of Langson to the extremity of the Malay peninsula and Singapore. With Hongkong pushing its roads towards Canton, and the governments of Kwangtung and Kwangsi taking an active interest in highway development, not many years will elapse before it will be possible to motor from Hongkong to Singapore.

As a matter of fact, there are only a few sections from Langson south that remain to be completed. The road work in Fukien, Chekiang and Kiangsu provinces which is proceeding as rapidly as local funds can be advanced for construction, will bring the coast road to Shanghai. It sounds like a far off dream, but construction is going ahead and the dream may become a reality before two or three years are passed.

Is it worth while to assist in this development ? If so, the automotive manufacturers not only of America but Europe should give serious attention to conditions in the Far East and exert influence upon their governments and financiers to find a way whereby financial assistance can be extended to China.

Trade Follows the Loan

ONCE in a blue moon, some hard-headed American business man comes to China and after listening to all the confidential rot poured into his ears about the monopolistic tendencies of the other powers which exclude Americans from the field, he forms his own conclusions from the facts. Such an observer was Mr. C. H. Chubbock, the vice-president of the McClintic-Marshall Company, one of the largest structural steel firms in the United States. In recounting his experiences to the Engineers' Club of Philadelphia, he gave his views upon the possibilities for American engineering business in China, and went on to give his opinion about the probabilities. He said : " But what are the probabilities ? The probabilities are that on account of the American banker an engineer going out from here can spend months, can work his head off, and when he gets through he will come away the most disgusted man that ever 'came down the road.' An engineer of the Peking-Hankow Railroad told me, 'We like the Americans. We would rather do business with them than with anyone else on the face of the earth. But the European nations, French, British, Belgian, German and Italian, all of them will accept our loans and you demand an irrevocable letter of credit.' China is in exactly the same position as the United States west of the Mississippi River fifty years ago. If our American bankers then had taken the same attitude towards the development of our western states as they take toward the development of China, our great western areas to-day would still be a howling wilderness. *Gentlemen, trade follows the loan.* And as you travel around the world—I do not care whether it is China, Australia, the Malay States, New Zealand or wherever it is—an American representing large business interests has that constantly thrust into his face. On the Yellow River bridge, the only bid that did not figure on payment in government bonds was the American; and that I know, because mine was the only American bid.

"Now, how are you going to overcome that difficulty. Gentlemen, I advise you to go out there and look over the entire field· I am heartily in favor of Mr. Steinmitz's idea of having American engineers go over there and study the situation, but until our banking system becomes international in scope, you cannot do anything except become intensely interested and mad clear through to the backbone.

"You will find many opportunities. But the trouble is we send men who are not men of imagination—they are not men of vision. We send lawyers. Now, lawyers are fine in their place. But you know perfectly well that when you want to design a building, you have to see the picture before there is anything else done. You have to see that first and see it on a piece of paper. You will have to support the vision. A lawyer will tell you what is the matter with it after it is all over, but not before. So much for China."

Sharp, brief and to the point. Mr. Chubbock as an engineer probably left China " mad clear through to the backbone." We sympathize with him.

Commercial Aviation

A UNIFORM law governing the use of airplanes is essential if commercial aviation is to be developed on a business basis, in the opinion of the National Bank of Commerce in New York. Such a law must be at least national in scope and should be international, the bank believes.

" The development in the United States has been along lines different from that in Europe," the bank says in discussing the subject in the November issue of its magazine, *Commerce Monthly*, " due partly to the fact that the public has not been familiarized with flying as were the populations of the belligerent European countries and partly to the absence of a definite government policy. Commercial transportation companies have received neither assistance nor encouragement and in consequence private enterprises of this nature have accomplished very little. On the other hand the government, in the army, navy and post office departments, has been active in experiments of great value to commercial aviation so that in the United States the one distinctive example of successful aerial transportation on a large scale is not strictly commercial, but is merely civil, as distinct from military aviation.

" At the present time the air mail, including its contract lines, is the only manifestation of commercial activity in the air on any considerable scale in the United States. It is estimated that there are about one hundred transportation companies in the United States, but regular operation of substantial commercial importance has scarcely begun.

" Commercial aviation is laboring under many difficulties. By far the greater part of the material in use is converted war material, built for extraordinary performance rather than economy. This material must in some way be worked off the market before new and better models can profitably be built. Traffic is light and variable and the uncertainty of its future volume and nature is a severe handicap. There are in addition many technical details, both in regard to material and organization, that appear to be of a minor character but frequently turn out to be important to economical operation. The greatest handicap by far to further development lies much deeper than present financial prospects of the industry. It is the continued lack of public confidence in the safety and reliability of air transportation.

" Since the armistice accidents have been increasing in number in some countries at a higher rate than the increase in flying. The most carefully compiled figures, those for British commercial aviation, show the death rate of passengers to have increased from 0.10 per thousand passengers carried in the six months ending March 31, 1920 to 0.22 in the six months ending September 30, 1920 and to 0.30 in the six months ending March 31, 1921. In the twenty-three months from May, 1919 to March, 1921, inclusive, twenty persons were killed and twenty-one injured in a total of forty-eight accidents or one accident for every 33,200 miles flown. In the United States the number of casualties, both in military and civil flying, has been alarming, although it is not possible to determine the accident rate as no official reports are required either of flights or accidents.

" The situation in the United States in this regard is very much worse than in most other countries, where government supervision of civilian flying is practised. The lack of official regulation of aviation, in some form, is the greatest detriment to increased safety in flying in the United States. The present situation in the United States is one of total absence of regulation, with the exception of a very few state laws and municipal ordinances. In most parts of the country there is nothing to prevent any pilot from operating any machine, without regard to his competency or its condition. It may well happen and often does happen that an irresponsible pilot will fly a machine unfit for use, with imminent danger to the life of himself, his passengers, and the safety of the community. In case of accident the entire aircraft industry suffers through the injury to its most vital asset, its reputation with the public.

"The operation of airplanes for other than transportation purposes would, if properly regulated and supervised, perform a valuable service to commercial aviation by familiarizing large numbers of people with the advantages of aerial transportation. A system of licensing by which the safety of such flying could be improved cannot be established, however, without the enactment of an air law. That an air law must be at least national in scope is evident from the very nature of aviation and considering the distances already covered by commercial air routes the advantage of a law which is internationally uniform is apparent.

"Efforts to establish an American air law have encountered a fierce conflict in regard to the form of the supervising organization and as yet have been without tangible results. It is gradually being realized by all those concerned with the future of American commercial aviation that the need for an air law is so pressing that its method of administration is a secondary consideration. When this attitude becomes general substantial progress may be expected. Wise regulation may be expected to give a certain stability to the air transportation industry essential to any industry which must appeal for credit and for investment capital. Until this is attained air transportation cannot be said to be on a business basis."

Artificial Silk

ARTIFICIAL silk may offer severe competition to the natural product of the lower grades as a result of present conditions in the silk market. The National Bank of Commerce in New York declares in its magazine, *Commerce Monthly*, that the greatly increased capacity of domestic producing plants indicates that American manufacturers of artificial silk goods may in the future be practically independent of foreign supplies.

"The position of the United States in international trade in artificial silk has been radically changed since the beginning of the war," the bank says. "For some ten yeals before domestic production began in 1911 the United States imported artificial silk threads and yarn, although the quantities are impossible to trace before that year. From 1911 until 1915 both production and importation increased, the former more rapidly, so that in 1915 about 60 per cent. of the total consumed in the United States was produced at home. The submarine warfare and the intense need of all textile materials in Europe, coupled with a reduced production in most European countries, caused a sharp decrease in imports at the same time that production in the United States was rapidly expanding. In consequence 98 per cent. of the 1918 consumption was of domestic manufacture. Soon after the close of the war European production was resumed and expansion begun and American imports in 1920 and 1921 approached in volume and greatly exceeded in value the high figures of 1914 and 1915 despite a greatly increased domestic production. In 1920 domestic yarns comprised about 80 per cent. of the total consumption.

"The first producing plant in the United States was established in 1911 as a branch of an English firm and used the viscose method. For many years this was the only important produce in the United States. From the 1911 figure of 320,000 pounds the production of this concern mounted to 9,000,000 pounds in 1920 and at the present time expansion is under way which will more than double its capacity. The increased demand for artificial silk in 1920 led several other large concerns to enter the field. The most important of these are affiliated with prominent manufacturers in Belgium, France and Italy.

"Although the potential production of plants now operating or under construction is far above any consumption figure yet attained, manufacturers believe that the market for artificial silk has as yet been only partially developed. It is significant that except for the latter part of 1920, when all textile industries suffered a depression, the demand for artificial silk from the beginning of the war so far exceeded the supply that the output of American plants was allotted to important consumers and until recently has rarely been sold in a freely competitive market. American producers have made little effort to expand their market as it was impossible during the war to increase production to supply new customers.

"Of the total consumption in the United States the largest share used in any one industry is in the manufacture of hosiery. In the last few years the production of sweaters and other knitted goods has been important. Artificial silk is woven with natural silk, cotton or other fibre into dress goods, such as satins and fancy silks, and shirtings and tapestry. Plushes, carpets and imitation furs are now made of artificial silk and many kinds of fringes, tassels and novelties.

"The manufacturer of artificial silk has also the opportunity of developing other products with the same equipment and raw material. By increasing the size of the aperture through which the cellulose solution is forced artificial hair may be produced, of value in the manufacture of hats, upholstery materials and fancy goods. By changing the shape of the apertureto a horizontal slit, he may make artificial straw, or by further widening the slit strips of artificial leather or cloth, films, ribbons or thin transparent sheets such as are used in facing envelopes and wrapping candies.

"A method has been devised in which net and simple forms of lace are produced in one operation, by passing the solution into engraved lines on a revolving cylinder, from which the finished product is continuously peeled as it issues from the fixing bath. Further progress in this direction may be confidently expected as the possibilities of cellulose are as yet far from exhausted.

"Artificial silk is chemically unlike natural silk and differs in most of its physical properties so that there has not been direct competition between the two fibres. In the period of activity in textile markets which followed the close of the war the demand for both these fibres exceeded the supply. Such substitution of artificial silk as was possible served only to release natural silk for other purposes. The present condition of the silk market, however, offers the possibility of severe competition between artificial silk and the lower grades of natural silk as the supply of the latter is in excess of immediate needs.

"In view of the greatly increased capacity of American producing plants, and of the apparent policy of foreign producers to affiliate with producers in the United States rather than to obtain a market in the United States for foreign products, it is probable that American manufacturers of artificial silk goods will in the future be practically independent of foreign supplies, and it is even possible that yarn may be exported in important quantities. The variety of sizes and kinds of artificial silk which can now be produced in the United States leaves little to be feared from foreign competition, and the export trade in hosiery and other manufactures has a promising future."

Fushun-Mukden Power Service

The electric power transmission system from Fushun Collieries to Fengtien (Mukden), in course of construction since last year, under Sino-Japanese joint management at the cost of Y.560,000, has been completed, and the actual transmission of power may be opened by the middle of February.

This project was conceived five years ago, but actual work has been deferred owing to the difficulty of securing the consent of the Chinese. Mukden had been feeling the inadequacy of power supply. Such plants as the Manchuria-Mongolia Woollen Manufacturing Co., the Manchuria-Mongolia Fibre Industry Co., and other plants have been suffering from the short supply of motor power. Against the 1,400 kilowatt capacity of the present power station, the monthly demand runs up to over 300,000 kilowatts. When the new arrangement comes into operation, 3,000 kilowatts will be supplied from Fushun, which will prove sufficient for the few years to come. The capacity of the new installation may be raised, with a little alteration, easily to 6,000 kilowatts.

MANCHURIA and MONGOLIA

The Lands of Opportunity

Sheep Grazing at the S. M. R. Agricultural Station at Kungchuling

I. Geography

GEOGRAPHICAL SCOPE.—There is no definite boundary to what is generally called "Manchuria and Mongolia." What are often referred to as Japan's special privileges in Manchuria and Mongolia are embodied in various treaties, protocols, etc., and allude to rights in South Manchuria and the Eastern Inner Mongolia.

ADMINISTRATIVE DISTRICTS.—Manchuria consists of the three provinces of Fengtien, Kirin and Heilungkiang, subdivided into the following minor districts :—

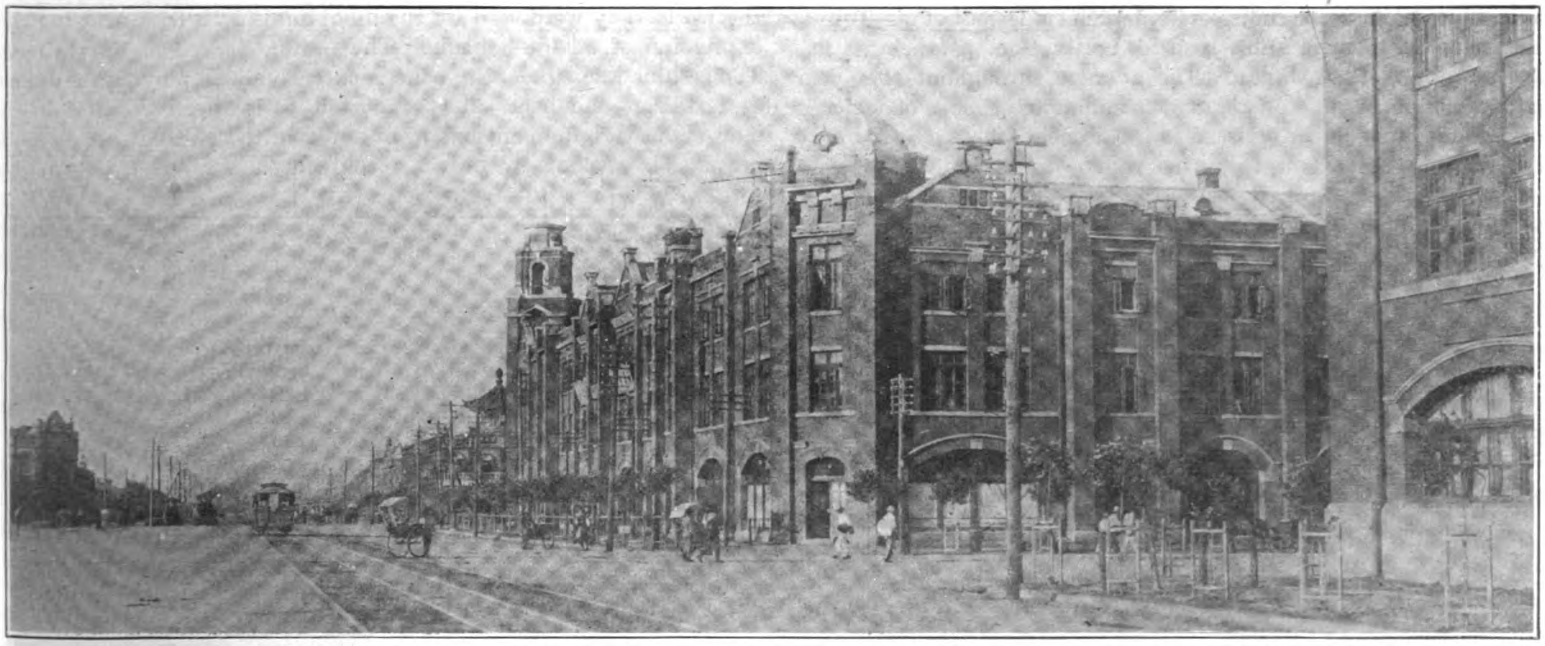
Fengtien into 5 *tao* (district superintendencies) and 57 prefectures ;
Kirin into 4 *tao* (district superintendencies) and 39 prefectures ;
Heilungkiang into 3 *tao* (district superintendencies) and 31 prefectures.

Each province has a *tuchun* (military commander) to supervise military affairs and a civil governor under whom are the *taoyin* (district superintendents) and prefects. The real political power is, however, held by the military commander.

Eastern Mongolia is divided into the four tribes of Chelimu, Chasakotu, Chaowuta and Hsilinkuoerh, subdivided into thirty clans, each having its own chieftain. The Mongolians being nomads, the waste lands in their country are being colonized by Chinese.

TOPOGRAPHY.—The eastern part of Manchuria is mountainous, and borders on the Russian littoral provinces and Chosen by the Ussuri, the Tumen, the Changpai range, and the Yalu. On the west, the vast level plain of Mongolia stretches afar to the horizon, part thereof being walled by the Hingan range. On the north, it adjoins the Russian Amur province across the Amur, whilst on the south the Yellow Sea and the Gulf of Pechili wash its shores. For some distance, it borders on China proper following the Great Wall. The Mongolian plain is undulating and contains deserts and alkaline belts. The rivers are the Liao, the Sungari with their tributaries, the famous Yalu and Tumen, the Muling, etc. The valleys of these rivers are fertile, highly suited to cultivation. Even in the hilly regions, there is little space admitting of reclamation.

AREAS AND POPULATION.—There are no accurate statistics about either land areas or population.



The New City of Mukden with wide avenues and beautiful buildings created in the Japanese railway zone. The Chinese city in all its squalor and dirt lies three miles distant, connected with the S. M. R. Railway Station by a horse tramway

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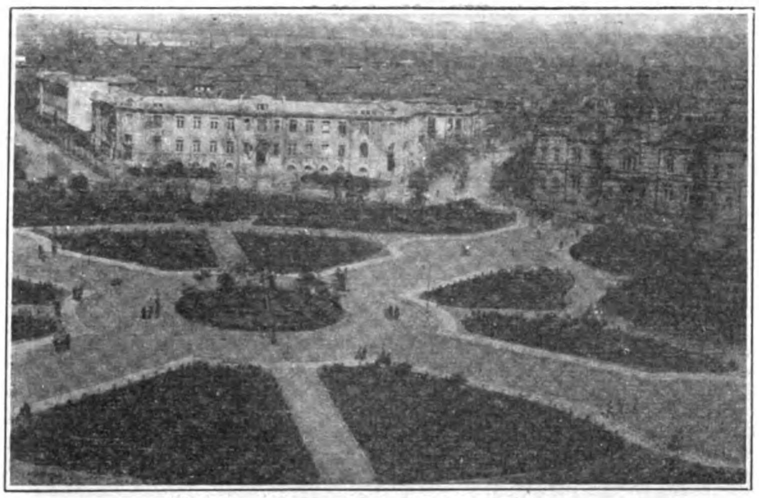
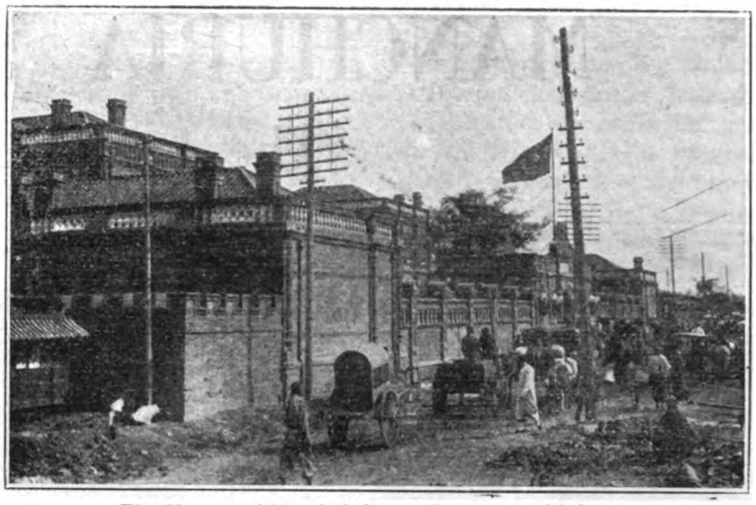


The Magnificent Civic Centre at Dairen



The Yamen of Marshal Chang Tso-lin, at Mukden

According to a recent estimate of the South Manchuria Railway Company, the areas and population of Manchuria and the Eastern Inner Mongolia are as follows:

	Area square *ri*	Population
Fengtien province..	15,151	11,979,400
Kirin province	13,605	5,638,700
Heilungkiang province	35,497	2,494,000
Eastern Inner Mongolia	10,168	4,366,000
Total	74,421	24,478,100

Remarks: 1 square *ri* is approximately 6½ square miles.

The above shows that Manchuria and Eastern Inner Mongolia are far larger in area than Japan, but with only one-third the latter's population. The average density of population is 330 per square *ri*. In Fengtien province, the land under cultivation reaches 60 per cent. of the arable area and has the highest density of population. Manchuria is inhabited by Manchus and Chinese, and Mongolia by Mongolians and Chinese settlers. There are also about 600,000 Koreans, 1,200 Russians and 200,000 Japanese. Chinese farmers are taking up land in large numbers, and with the natural increase of population, the annual rate of increase is placed at between 400,000 and 500,000.

CLIMATE.—The climate of Manchuria and the Eastern Inner Mongolia is what is called "continental" with extremes of heat and cold. People labor under the impression that Manchuria is frigidly cold, forgetting that its summer is intolerably hot. In summer, both South and North Manchuria is as hot as Tokyo. This makes Manchuria a fine land for cultivation. Manchuria has far less rainfall than Japan. The average throughout the year is one-third of Japan's or about 600 millimetres, most of which is bad in June, July and August. In the Mongolian plain, it is windy in spring. No storm or torrential rain is known in autumn.

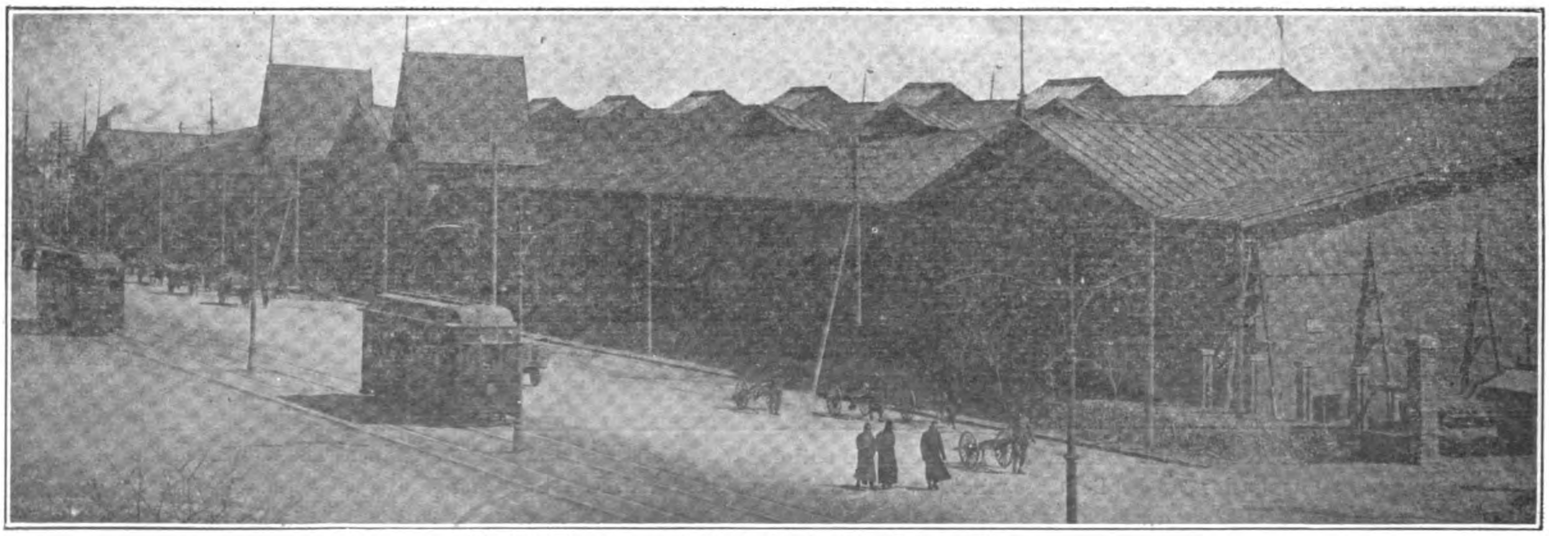
II. Agriculture

RAILWAY AND DEVELOPMENT OF AGRICULTURE.—The vast plain of Manchuria and Eastern Inner Mongolia is covered with layers of loam, clay and humus, making one of the most fertile agricultural countries in the world. The Chinese Eastern Railway, the South Manchuria Railway, and the Peking-Mukden line of the Chinese Government Railways carry annually large numbers of immigrants and immense stocks of produce, facilitating the development of agriculture

According to investigations of the S. M. R. Co., the total area under cultivation is about 39,100,000,000 *tsubo*, of which 32,510,-400,000 *tsubo* is in Manchuria and 7,692,000,000,000 *tsubo* in Eastern Inner Mongolia. The farming lands awaiting cultivation is put at about 30,000,000,000 *tsubo*, of which 80 per cent. lies in Heilungkiang province. The annual increase of area under cultivation ranges from 900,000,000 to 1,200,000,000 *tsubo*.

(*a*) BEANS.

Beans may be classified into yellow (soya) bean, blue and black beans. In fact, there are more than two hundred species of beans. The yellow (soya) beans belong to the most common species, containing a good percentage of oil and are used as an article of food and for the expression of oil. Now widely known all over the world they were used by the inhabitants as a food and for the expression of oil for lighting. The residue served as cattle feed. The residue known as bean cake is extensively employed in Japan as fertilizer, and bean oil is exported to western countries. A marvellous development has been noted in the cultivation of soya bean. This belongs to only a recent date.



Electric Tramcars and Goods Sheds at the Dairen Wharves

Bean milling industry, too, has correspondingly grown up, and along the South Manchuria Railway lines, and especially at Dairen, there are a large number of bean mills on a considerable scale. The beans, bean cake and bean oil exported from the port of Dairen have reached 3,000,000 tons annually in recent years.

The Chinese not only use beans and bean oil in their daily cooking, but also *tofu* (bean curd palatable also to the western palate and pronounced by the qualified chemist as similar in its composition to cow's milk), *miso* (an article of the staple food to both Japanese and Chinese), and *soy* are also made from beans. Bean oil exported to the west is understood to be refined as substitute for cottonseed oil, peanut oil, linseed oil, etc., and even for animal fat. It can be made into soap, oleomargarine and paint. New utilities are being invented for beans and bean oil.

Beans put out in Manchuria and Mongolia are put at about 20,000,000 *koku* (1 *koku being equivalent to* 4.96 *bushels*), but the outputs are increasing rapidly year by year, and there is a vast area of territory awaiting cultivation.

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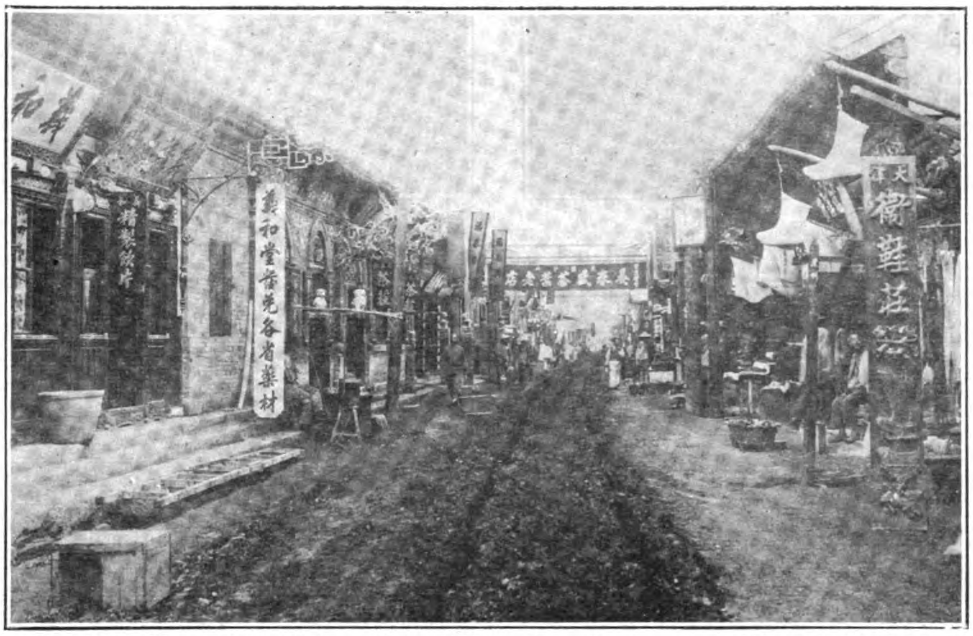


The Main Street of the Chinese City of Changchun, the terminus of the S. M. Railway

The analyses of bean oil at different spots in Manchuria are as under, the average of ten samples being given :—

At	Oil	Water
Harbin	17.77 %	11.90 %
Changchun	18.16 %	10.27 %
Kaiyuan	18.14 %	10.76 %

Next, the results of analyses of beans of different kinds are as follow, the average of several samples being given :—

Beans	Crude oil	Albumen	Carbohydrate
Yellow (soya) ..	11.78 %	16.92 %	14.99 %
Blue	37.32 %	37.62 %	38.65 %
Black	21.77 %	22.19 %	26.06 %

(*b*) KAOLIANG.

Kaoliang is ubiquitous in Manchuria. It is grown most extensively and is the chief of the staple food of the natives. For this reason, in North Manchuria, in which *kaoliang* is produced in less quantity than in South Manchuria (while the cultivation of wheat is incomparably larger), a restriction is put by common consent upon the amount of *samshoo* (a kind of alcoholic drink) distilled from the same cereal.

The Nippon Bridge over the S. M. Railway Tracks at Dairen connecting the old Russian Town with the Modern City

Kaoliang is first husked and cleaned before being cooked in the form of gruel or being boiled and then sun-dried. It is also used as fodder.

Recently, a Japanese resident at Dairen has hit upon a process by which a fair imitation of rice can be made from *kaoliang* in shape and taste.

As previously hinted, *samshoo* is distilled therefrom in large quantities.

The *kaoliang* stalk is used as fuel and a building material, and further matting is made therefrom. Its uses are varied as well as extensive.

The annual outputs of *kaoliang* are estimated at 36,000,000 *koku*.

(*c*) ITALIAN MILLET.

Italian millet, when cleaned, is called *hsiaomi* (small rice) by the Chinese. Its importance ranks only next to *kaoliang*. An intoxicant known as *huangchu* (yellow drink) is brewed therefrom. It has divers species, and the tallest grows as high as from 6 to 7 feet.

The millet straw supplies the chief fodder for the domestic cattle, whilst the millet bran serves as hog feed. On this account, the millet, too, is raised everywhere, its yearly production being placed at 30,000,000 *koku*.

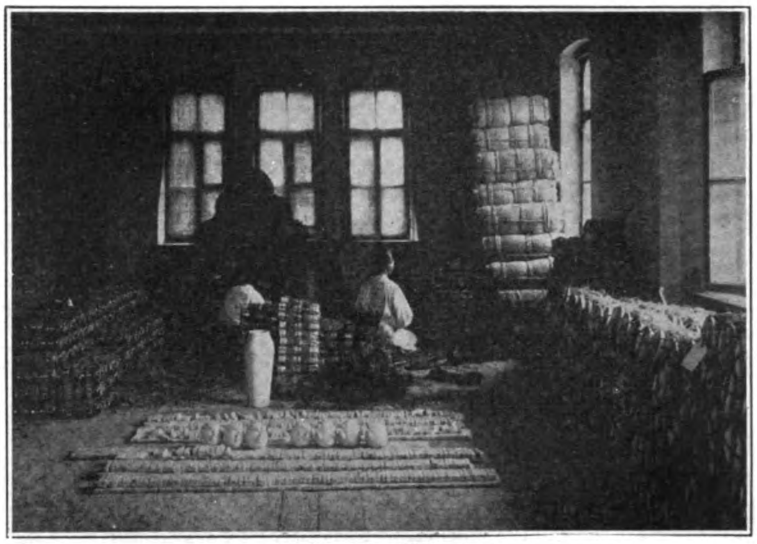
(*d*) MAIZE.

Maize may be subdivided into three kinds—yellow, red and a native breed called *laolaichou*. It is grown in the south of South Manchuria and also in part of North Manchuria and also forms an important article of food. In North Manchuria, an intoxicant is brewed from it. The stalks are used as an article of fuel whilst the leaves are good for fodder. The annual outputs are about 10,000,000 *koku*.

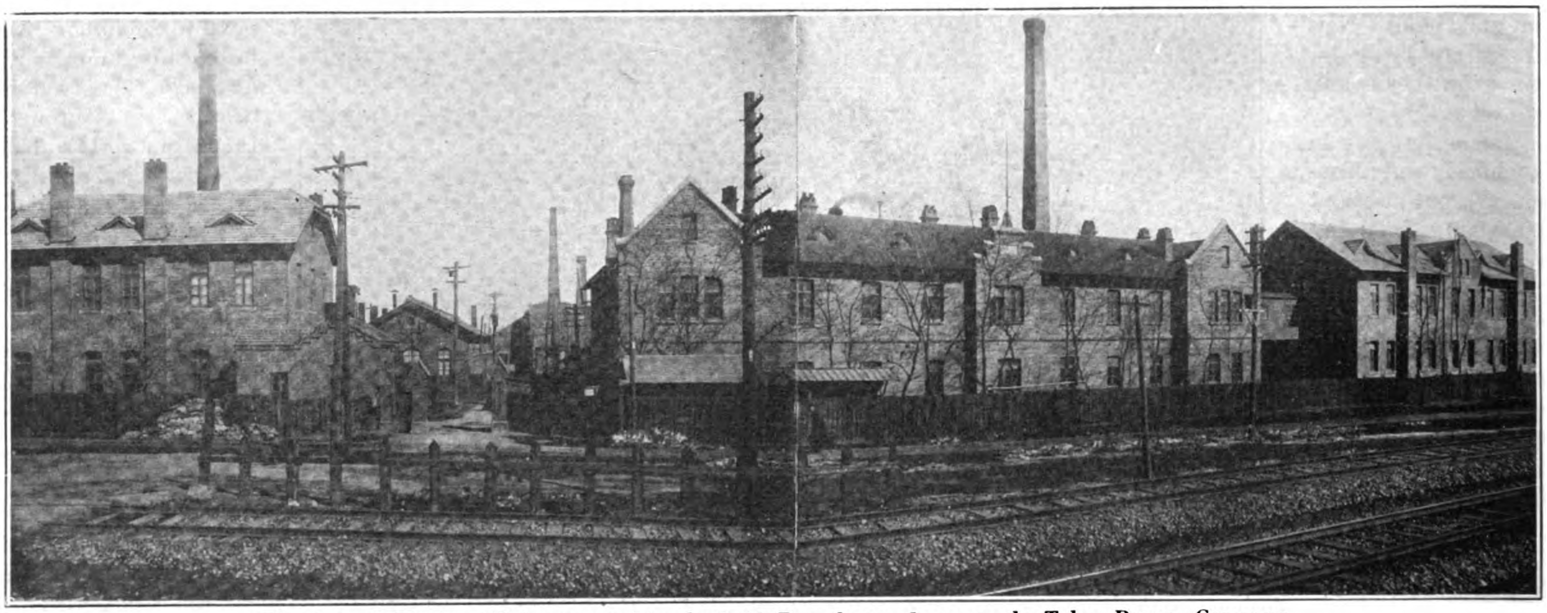
(*e*) RICE.

Rice is known as *tami* (large rice in distinction from *hsiaomi*, small rice or millet) among the Chinese. It is a valuable article of food too to the Chinese peasantry. Upland rice, which is grown on dry farms, is produced to the extent of about 3,000,000 *koku*, and ordinary rice raised on paddy fields to the extent of about 500,000 *koku*, in both cases unhulled. It may be mentioned that the growing of ordinary rice has been undertaken in Manchuria only in recent years, and is therefore still produced to an inconsiderable amount. However, both soil and climate are well suited to its cultivation. The Korean settlers in Manchuria

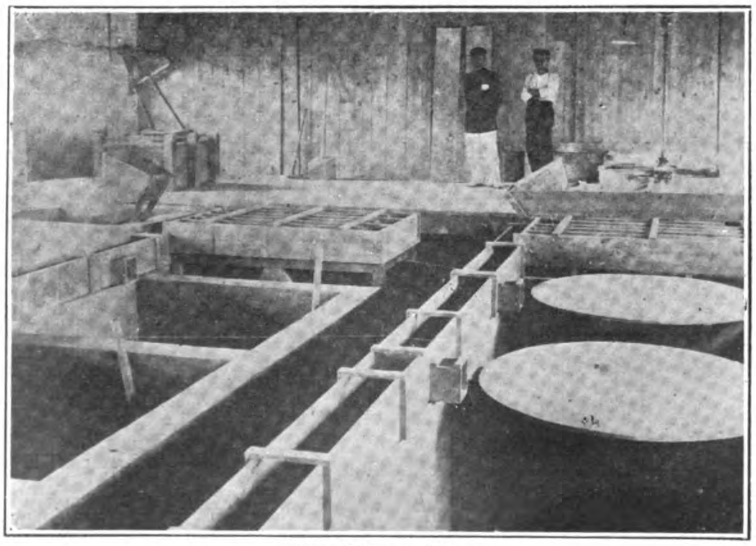
Decorating Bowls



Packing for Shipment



The Ceramic Works at Dairen erected by the S. M. R. and turned over to the Tahua Pottery Company

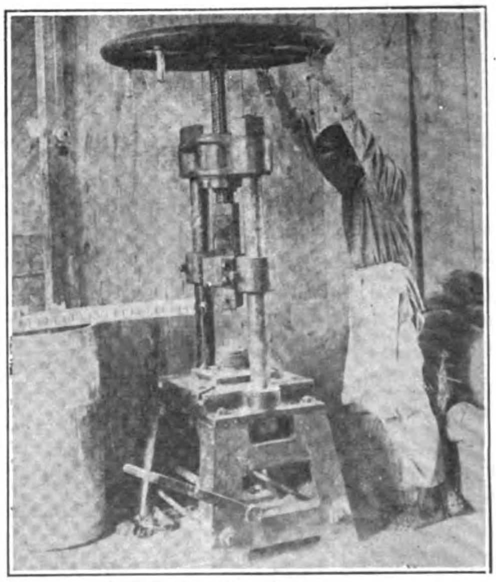


The Mixing Vats

nearly monopolize the cultivation of this cereal. The amount of cultivation is expanding yearly at a rapid pace. The land area open to rice farming is estimated at 4,500,000,000 *tsubo* (1 *tsubo* being equivalent to 36 square feet).

(*f*) Other Crops.

Among other agricultural crops popularly grown may be enumerated red beans, kidney beans, millet, wheat, cock'sshin, buckwheat, oats, potatoes, etc.



Moulding Press

DEVELOPING MANCHURIAN RESOURCES

Under Chinese rule, the manufacture of pottery in Manchuria was confined to coarse earthen ware. The cheapest table ware was imported from other parts of China. The central laboratory of the South Manchuria Railway at Dairen investigated the possibilities for manufacturing fine white china and glassware from native raw materials and the result was the establishment of the large ceramic works at Dairen, whose management in 1920 was handed over to the Tahua Pottery Company. At present the works turn out a superior grade of table crockery, insulators, and especially bowls for Chinese consumption. The products are being exported even to Japan.

Next, as regards crops for special uses, hemp, flax, tobacco, sesamum, perilla, melon-seed, etc., are grown.

The hemp and flax crops are placed at some 40,000,000 *kin* a year. The tobacco is produced in Kirin province to the annual amount of about 50,000,000 *kin*. Still, the supply being inadequate, about Y. 6,000,000—7,000,000 worth is being imported yearly.

Next, turning to agricultural crops introduced lately, the sugar beet has been found to thrive excellently. The flax is looked upon in a similar light.

In the belt from the Kwantung leased territory up north to Mukden, the orchard industry is pronounced as promising. For instance, superior species of apples, pears, grapes, etc., are produced recently in increasing quantities.

Method of Cultivation.—Agriculture in Manchuria may appear crude to a casual eye, but when one looks deeper into its methods, one will easily find that what are in vogue are sensible devices adapted to climate and soil and developed through stages. In harrowing and ploughing, oxen, horses and mules are employed to draw the ploughs and harrows, and rollers are brought to play in levelling work after the western fashion. Domestic cattle are utilized to economize human labor, and in these respects, the Manchurian methods differ from the Japanese ways.

In fertilizing lines, droppings of the domestic animals and night soil are mixed with rich soil and are left in heaps, exposed to the weather for about three years. Chemical fertilizers still remain strangers to the native peasantry.

In dealing with the cereals, after they have been harvested, the grain is unhusked with the help of the domestic animals, and then it is packed in gunny or cotton bags to be carted to the market. The domestic animals are used also in cleaning the grain and in the home milling of flour.

Insects' ravages are considerable in some years, but the peasantry, whose heads are crammed with old superstitions, hold them as little short of a visitation and do not trouble themselves with their extermination or prevention. Luckily, the happy climatic effects Manchuria act fatally upon these insects, and it is through this natural boon that their harm is not more serious.

Management.—Farming is carried on by the land-owners and the tenants. The tenancy system may be divided into three kinds, ordinary, profit sharing and contract plans. In extensive farming, in some cases, over 300,000 *tsubo* of land is looked after by a single family. Those attending from 60,000 *tsubo* to 150,000 *tsubo* of land each are rated as farmers of intermediate class. The petty peasants have only 15,000-60,000 *tsubo* to till, and in many cases, not more than 4,000 or 6,000 *tsubo*.

In Manchuria there is an element that is termed as farming hands who are helpers immigrating into Manchuria from Shantung, etc., which are more densely populated.

Agricultural Installations.—In lines of agricultural installations, the Chinese authorities maintain agricultural experimental stations at Fengtien (Mukden), Kirin and Tsitsihar.

The South Manchuria Railway Company, having recognized early the urgent necessity to improve and advance the agricultural methods in the development of Manchuria and Mongolia, has founded an experimental station at Kungchuling and Hsiungyocheng each at enormous outlay, and has been carrying on the investigation and experiments of agricultural methods, stock farming and afforestation.

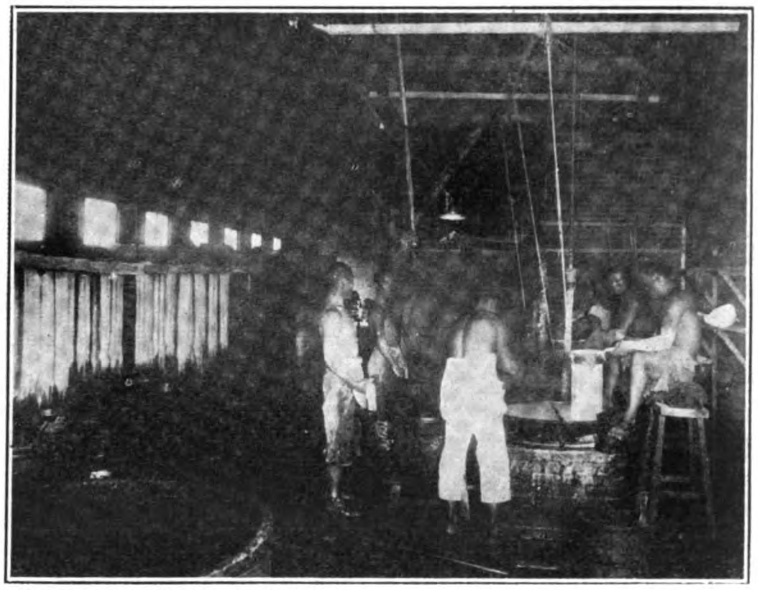
An experimental station for the cultivation of the tobacco has been opened at Telissu between Wafangtien and Hsiungyocheng.

In addition, minor experimental stations are maintained at Chengchiatun on the Ssupingkai-Taonan line of the chinese government railways.

At the Kungchuling station, such corps comparatively new in South Manchuria as sugar beets, tobacco, flax, etc., are being experimentally raised, while the improvement of the bean breed has been receiving special attention. The stock-farming division has conceived the idea of improving the sheep breed, and incidentally the hog breed.

At the Hsiungyocheng station, sericultural industry, fruit raising, horticulture, and afforestation have been studied.

These investigations and experiments are expected to bring in important results to the agricultural Manchuria.



Making Vermicelli at Wangchiatun near Dairen, for Chinese consumption

III. Stock-Farming

Stock-Farming Country.—The Japanese farmers are short zsen of cattle for use in the field. Therefore, Japanese agriculture is often referred to as "agriculture without animal help." In striking contrast with this state of things, in Manchuria, stock farming is indeed almost universal among the farming classes, and few farming houses are met with that do not keep at least three or four heads of cattle, horses, mules, etc., and some pigs and poultry, into the bargain.

It may be said that the Chinese are not always more attached to stock-farming than the Japanese, but they beat the Japanese hollow in the knack of domesticating and training the domestic cattle. Five or six head of cattle, horses, mules or donkeys are hitched up at random to a heavily-loaded cart, and this motley team is managed with admirable dexterity by a Chinese driver with the cracks of whip in hand.

As to the Mongolians, they are nomads, and the live stock serves as the only means of sustenance to them. In other words, they keep live stock consisting of cattle, horses, sheep, etc., and lead a nomadic life from place to place.

We shall now give a resume of the stock farming in Manchuria.

(*a*) HORSES.

Manchuria and Mongolia are what has been referred to from old times in China as the finest horse breeding centre. The horse all belong to the Mongolian breeds. They stand 4½-ft. and 4.75-ft. long, weighing 583-lb. on an average. They are rather undersized but well proportioned. They are built very strong and are used to coarse feed, neglect and even exposure; moreover they have endurance to a wonderful degree. In ordinary circumstances, those that can pace are used for riding purposes, and the others as draught animals.

According to the latest returns prepared by the South Manchuria Railway Company, the horses in Manchuria and Inner Mongolia number about 2,500,000 head, comprising 750,000 head in Fengtien province, 500,000 head in Kirin province, 510,000 head in Heilungkiang province and 810,000 head in the Eastern Inner Mongolia.

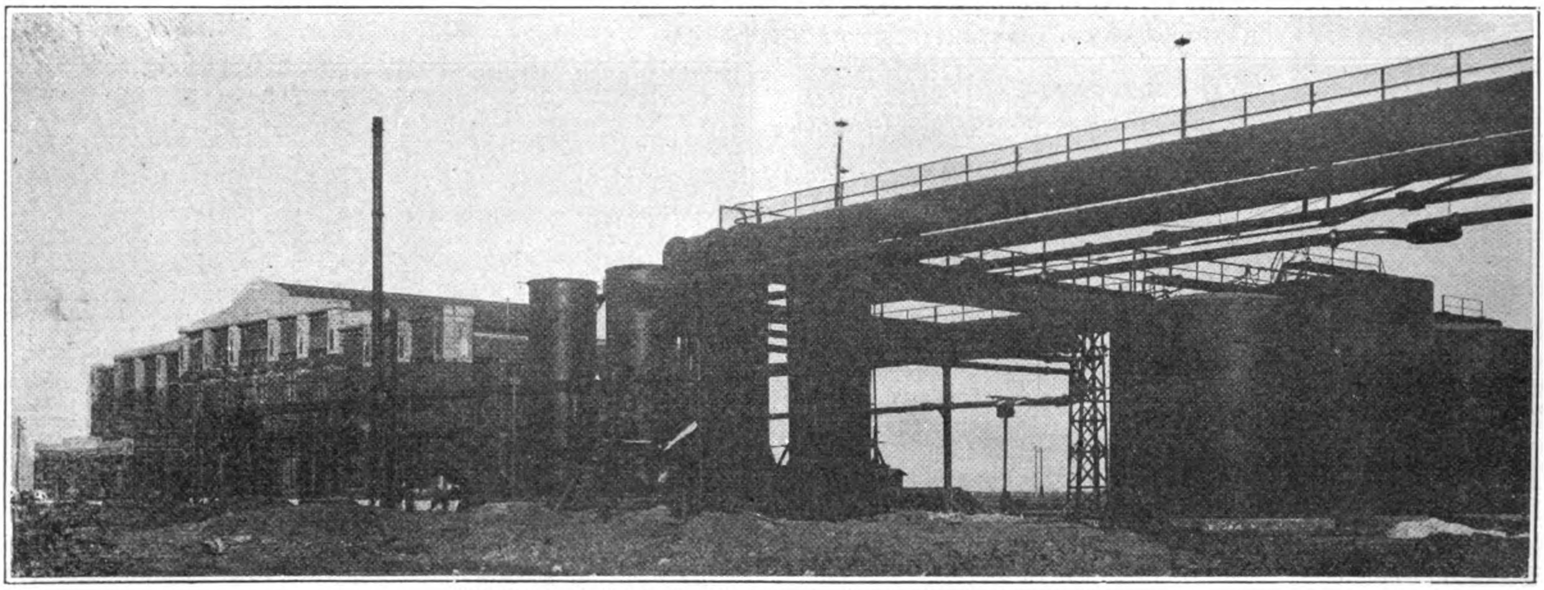
(*d*) CATTLE.

The cattle in South Manchuria, etc., belong to the Korean, Shantung, Manchurian and Mongolian breeds. The first mentioned two breeds are comparatively small in number, the last mentioned two constituting the majority.

The Chinese keep cattle to work them, and the Mongolians for the milk they yield, the beef being regarded as by-product.

The cattle in South Manchuria and Inner Mongolia are defectively developed in hinderpart and are rather inferior in all economic efficiency. But these drawbacks are made up by their power of endurance and docility, and that of withstanding neglect and exposure, which qualifications all go to befit them for hard labor. In weight, the heaviest is 1,166-lb., those weighing 666-lbs. being most common. Accordingly, they give a comparatively meagre amount of beef. In quality, the native breed is classed below the Korean and Shantung breeds, and gives only a stinted amount of milk. There is ample room for future improvement with the cattle as with the horse.

The cattle in Fengtien, Kirin, Heilungkiang, and the Eastern Inner Mongolia are put at 580,000 head, 90,000 head, 210,000 head and 1,120,000 head respectively, making the grand total of over 2,000,000 head.



Sulphate of Ammonia Factory at Anzan, South Manchuria

(*b*) MULES.

The mule is the cross breed between the she-donkey and the he-horse. It has existed in Europe and China from early times, but has been unknown in Japan. In size, the mule varies according to the sizes of its parent-animals, but is, in many cases, larger than the horse. This is because the he-donkey used for breeding purposes is what is known as the larger donkey standing from 4-ft. 7-in. to over 5-ft.

The mule is employed in both farming and transport. It has great endurance and is inured to hard labor of a long duration, ill-fed and ill-sheltered. It costs dearer than the horse.

There are 200,000 head thereof in Fengtien province, 230,000 head in Kirin province, 120,000 head in Heilungkiang province, and 70,000 head in the Eastern Inner Mongolia, totalling 630,000 head.

(*c*) DONKEYS.

What belongs to the class of smaller donkeys is commonly kept in the native households. One stands only about 3-ft. It is strong of body and thrives on coarse feed. Its bearing strength is great for its size, and this makes it suited to agricultural, domestic, and transport uses. Some 500,000 head thereof are in South Manchuria and about 100,000 head more in the Eastern Inner Mongolia.

In the Eastern Inner Mongolia, cowhides are put out in a considerable quantity, but owing to their poor quality and also the parasitic worm that eats out many holes in important parts, they have but an insignificant value.

(*e*) CAMEL.

The camel is found only in Mongolia. It is double-humped and stands 5½-ft. usually. It withstands the cold and is adapted to hard labor and is good to ride on. For this reason, it is an important medium of travel in Mongolia. Its number is put at about 4,000.

(*f*) SHEEP AND GOATS.

The sheep and goats are of Mogolian breeds. Hitherto they have been raised chiefly for their meat and skins, and the wool have been regarded as but a by-product.

The ewe weighs from 58-lb. to 83-lb.; the ram weighs about 125-lb. at the outside. One of its characteristics lies in storing nutrition in the fat rump.

Goats are a little smaller in size than sheep. They yield only a small quantity of wool.

The sheep gives not more than 3-lb. of wool each of a quality far from passable. Most of it has been exported to the United States.

On the other hand, the goats' hair is of finer quality, but is a matter of only a little more than 1-lb. per head.

With the recent development of woollen industry in Japan, both wool and goats' hair have begun to be exported to Japan in a considerable quantity.

In South Manchuria, goat-raising takes precedence of sheep farming among the Chinese. In Mongolia, the natives attach the highest importance to sheep-raising. In both cases, more or less mixed farming is in vogue. To the Chinese, sheep- and goat-raising is only a secondary occupation, but to the Mongolians, live stock forms the principal property asset and the chief item of sustenance.

Judging by the outputs of wool and goats' hair, both sheep and goats combined are put at 400,000 head, 100,000 head, 60,000 head and 2,000,000 head in Fengtien, Kirin and Heilungkiang provinces and the Eastern Inner Mongolia respectively, making the total of 2,660,000 head.

Seen from the traditional aims of sheep- and goat-farming more for the sake of the meat than for the wool, no improvement seems necessary, but since the greater utility of wool than the meat itself became more widely known, the benefit of a systematic improvement on scientific lines has come to be noted more keenly.

(*g*) Pigs.

Pork is accepted by common consent by the Chinese as the most palatable. Hogs are kept at every farm house from a few to a dozen head. The grounds and waste put out from the *samshoo* distilleries, flour mills, bean curd manufacturers, etc., are used for pig-feed.

A rough calculation of the total number of pigs names 3,550,000 head for Fengtien province, 1,250,000 head for Kirin province, 490,000 head for Heilungkiang province, and roughly 1,000,000 head for the Eastern Inner Mongolia, the grand total being placed in the neighborhood of 6,690,000 head.

In Manchuria, there are three classes of the pig. One kind is larger-sized and weighs some 292-lb. when $2\frac{1}{2}$ years old; another kind grows to weigh 150-lb., when a year old, and is known as smaller-sized; the other is medium-sized. Each kind breeds fast, and brings forth a litter of young numbering from ten to twenty at a time. The pigs' hair is coarse and long and is known as bristle, being a product of no mean importance. Bristle is exported abroad to be made into brushes. Most of it goes to Osaka, Japan.

How Domestic Animals are Tended.—As stated previously, the domestic animals raised by the natives receive but a nominal amount of attention. Cattle other than milch cows, horses and mules are kept either in roughly-made sheds or in the open yard. Millet straw is generally used for feed and is often given, mixed with maize stalks, straw, bean stems and grass. For richer feed, *kaoliang*, bean cake, wheat bran, etc., are added.

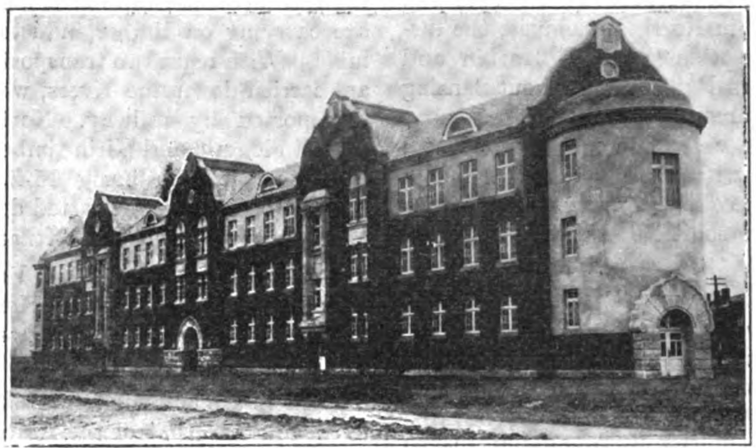
The Mongolians never build stalls or other shelter for their domestic animals, but leave them to look after themselves.

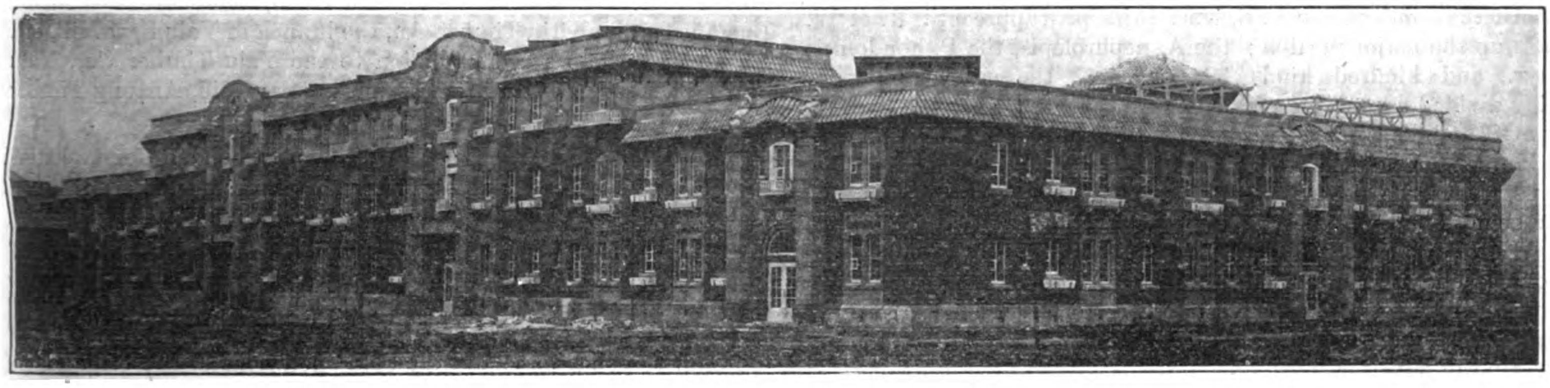
Some Chinese furnish shelter, but seldom provide for bedding.

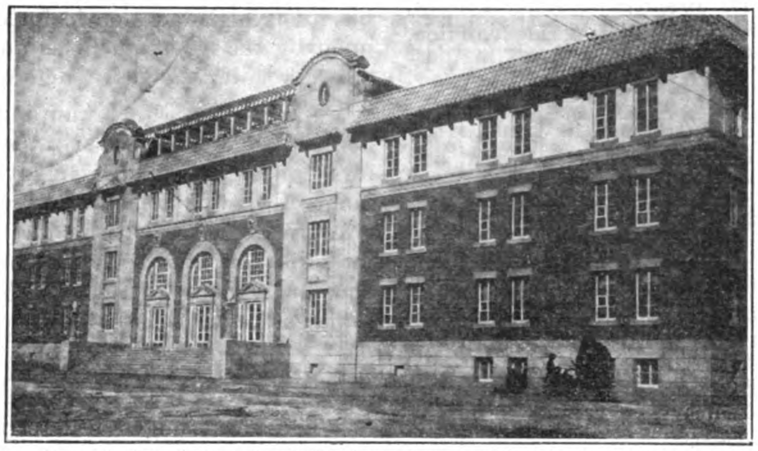
Pigs kept by the Chinese farmers are let loose in the daytime, and are put in the pen at night. The sight of lively pigs frisking after feed in the field after the crops have been harvested is one of the quiet rustic scenes in Manchuria. In winter, pigs are sometimes fed on hay laid by for them, but in the majority of cases, they are left to themselves to pick up feed.

The Mongolians seek lowlands in summer for water for their sheep, and in winter get behind the hills for shelter from the piercing wind.

The sheeps' skins clothe the Mongolians; their milk and meat serve as staple food-stuffs; and the wool is used to cover the huts and keep off the draught. Sheep to the Mongolians supply clothes, food and shelter.







How the South Manchuria Railway Company houses its Employees

Top and centre: Offices and Quarters at the Azan Iron Mines and Steel Works.

Bottom: Batchelor Quarters at Dairen.

Exports of Stock-Farming Products.—As already stated, Manchuria and Mongolia abound in domestic animals, and wool, hides and leather, animals' bones, bristles, cheese and other dairy products are put out in a great variety and quantity. But, the methods of production remain all primitive and none of them have yet developed beyond the stage of a domestic industry. There is plenty of room for future development in this direction.

The following are the exports from Manchuria during 1918:—

	Tls.
Domestic animals, including cattle, horses, mules, pigs, sheep, etc.	527,825
Wool, goats' hair, etc.	461,131

	Tls.
Bristle and horses' hair	353,309
Leather and hides and manufactures	787,099
Eggs	143,710
Animal oils	461,895
Animal's bones	129,367

IV. Forestry

Disposition of Forests.—In South Manchuria, the foot of the Changpai mountains along the upper reaches of Sungari, the Mutan and the Tumen, and also the upper parts of the Yalu and the Hun are densely wooded; while in North Manchuria, the districts about Hailin on the eastern section (between Harbin and Pogranichnaya) of the Chinese Eastern Railway and about Sansing in Kirin province are the principal forest lands.

On the other hand, Mongolia is a vast plain consisting of level land grown with grass and dotted with dunes. Nothing like a forest can be seen. Only amongst the Hingan range and the Yinshan range, there are believed to be some forests worth tapping, but no definite data are obtainable.

Principal Kinds of Trees and their Percentages.—So far about 300 kinds of trees are known in Manchuria and Mongolia, but the principal kinds number about twenty.

All the forests and woods being natural ones, the percentages of the different kinds of trees are subject to variance, but the conifers and the broad-leaved trees may be approximately placed at the respective rates of 40 per cent. and 60 per cent.

Of the conifers, the L. d. var. principis-rupprechtii R. et W. takes up the major portion; the A. nephrolepis, the P. hondœnsis Mayr., and kindred kinds 30 per cent., the minor remainder being divided among the rest.

Of the broad-leaved trees, the Q. Fabri Hance, Mongolian oak, T. Koreana Nakai, elm, poplar and their kindreds occupy some 70 per cent., the walnut, phellodendron amurense rupr., and such like being found in a meagre quantity.

In the forests of the Hingan range in the west of Heilungkiang province and in the north of Mongolia, the L. d. var. principis-rupprechtii R. et W., P. silvestris L., and B. japonica Sieb. (B. alba L. var. vulgaris D. C.), predominate, and there are found only few kind of superior trees.

Forest Areas and Assets.—In absence of reliable data, nothing definite can be set down, but from all reports available, the forest areas and their assets in Manchuria for 1918 may be roughly as follow:—

(*a*) On the right bank of the Yalu and along the Hun River; 2,004,000,000 *tsubo* with 347,655,000 *koku* of timber, at 520 *koku* per 9,000 *tsubo*.

(*b*) On the upper parts of the Sungari, the Mutan and the Tumen excluding such localities as have only a few hundred *koku* of timber (according to the investigations of the S. M. R. Co.); 5,892,000,000 *tsubo* with 1,315,519,000 *koku* of timber, at 670 *koku* per 9,000 *tsubo*.

(*c*) Along the eastern section (between Harbin and Pogranichnaya); 7,305,000,000 *tsubo* with 924,696,000 *koku* of timber, at 380 *koku* per 9,000 *tsubo*.

(*d*) About Sansing district; 15,873,000,000 *tsubo* with 2,816,-602,000 *koku*, at 495 *koku* per 9,000 *tsubo*.

(*e*) As to the forests in and about the Hingan range, no data can be obtained, except that in the district within the radius of about 30 miles around Horgo and Hingan stations for the centres, the average timber asset is put at about 450 *koku* per 9,000 *tsubo*.

Remarks: 1 *koku* is equivalent to 20 cubic feet.

Timber Industry.—The timber industry of Manchuria and Mongolia may be practically merged into the felling and utilizing of conifers. A great deal is exported to Tientsin as building material, but what is used for making coffins goes up to a considerable amount. As to the utility of broad-leaved trees, they are used for railway sleepers, mine timber and firewood, and for the making of charcoal, and little of them is employed for other industrial purposes. As timber markets, Kirin and Antung come foremost, followed by such consuming centres as Harbin, Changchun, Fengtien (Mukden), Dairen, etc. At Antung the Yalu Timber Company under Sino-Japanese joint management is located. Kirin has been a well-known timber centre from old times. At present there are divers Japanese and Chinese organizations engaged in putting out timber. Next, along the eastern section of the Chinese Eastern Railway, the railway management and Russians and Chinese have had railway sidings built to their lumber yards and are carrying on timber industry, including the operation of saw mills. With regard to transportation, both Kirin and Yalu timbers are carried down the rivers, whilst North Manchurian outputs are transported by railway. North Manchurian timber is usually 21-ft. in length, and Kirin timber is rafted down the stream in logs, the usual lengths being 15-ft. and 24-ft. As regards Antung lumber, ordinarily it is rafted down with two sides thereof stripped of the bark and roughly 16-ft. and 24-ft. lengths are most common.

Timber Dealers.—In Dairen the leading timber dealers include the Mitsui Bussan Kaisha, Ryoto Timber Co., Yamaba Yoko, Dairen Timber Co., Kwantung Timber Co., the branch of the Akita Shokai, etc.

There are at Fengtien (Mukden) the branch of the Yalu Seizai (Saw Mill) Co. that of the Akita Shokai, the Mitsui Timber Yard, etc. The chief dealers at Changchun include the Manchuria Timber Co., Changchun Saw Mill, etc. At Kirin, there are the Mitsui Bussan Kaisha, Kirin Timber Co., the branch of Yalu Saw Mill, etc. At Antung, there are, in addilion to the Yalu Timber Co,, Yalu Saw Mill, East Asia Timber Co., Antung Saw Mill, Antung Timber Co., etc.

Forests and their Political Bearings.—In order to attend to the affairs concerning the forests, the provincial government of Manchuria have each the board of foresty which issues laws, regulations, etc. However, the foresty administration exists only in name, and forest fires, reckless disforesting, illicit disforesting, etc., occur in succession, and the depletion of the forests is growing worse year after year. It is partially because of the inadequacy of the Chinese police force and the bold operations of the brigandage, which render the steady exploitation of the forestry assests impossible. The high taxation in force on the forests, which are looked upon by the government as an elastic source of revenue, is also answerable for the yearly deforestation in a measure.

Apart from the Kwantung leased territory, all along the South Manchuria Railways, the hills have become bared of trees for the most part. This is highly regrettable not only from a forestry point of view, but from several other considerations. Only, it is gratifying to hear that the question of afforestation is beginning to interest the Chinese officialdom and people as well. The South Manchuria Railway Company has been distributing gratis yearly saplings of different kinds to the Chinese applicants.

V. Marine Products

The Kwantung leased territory has only short coast lines. Still the Yellow Sea and the Gulf of Pechili abound in fish of all kinds, and fishery industry is being carried on on an extensive scale. However, outside the Kwantung leased territory, there are no reliable statistics available. The more important kinds of marine products found in the Kwantung coast waters include the following:—

Tai, cod, sword fish, *guchi*, sawara, sole, flounders, *suzuki*, shark, *nibe*, sardines, *shirasu*, cattlefish, octopi, sea-slug, oysters, earfish, prawns, lobsters, crabs, whales, seals, etc.

Fishermen in Kwantung Leased Territory.—The fishermen in the Kwantung leased territory are either Japanese or Chinese. The Japanese fishermen come from such prefectures in Japan as Yehime, Kumamoto, Kagawa, Oita, Hiroshima, Okayama, etc. They usually come over from Japan in spring and go home late in

autumn. There are about 200 odd fishing boats with some 1,500 fishermen, against about 16,000 Chinese fishermen. The chief hauls made by the Japanese are *tai*, and those by the Chinese are cod, *guchi* and swordfish.

The following are the figures for the past three years :—

	lbs.	
1917	25,135,150	Y.1,187,755
1918	25,631,675	1,617,493
1919	26,995,575	2,550,924

The whale-fishery about Haiyangtao Island, near which the naval battle took place in the Sino-Japanese war, is undertaken almost exclusively by the Oriental Whale Fishery Co. Few Chinese are interested therein. The catches are forwarded Shimonoseki way. Seals are captured on the ice-floes when the ice in the coast-waters break up on the return of spring in the north of the Yellow Sea and also in the north of the Gulf of Pechili. The annual hauls range between 700 and 800 head, and sometimes over 1,000 head.

Marine Product Industry.—The marine product industry still toddles in its infancy. Cod, *guchi*, mackerel, *nibe*, flounders, etc., are salted, and sea-slug, ear-fish, jelly-fish, shell-ligament, etc., are subjected to some preservation process by the Chinese. Some Japanese are turning out dried cod, and also working upon *tai* fish, but neither is worth mentioning.

Fresh Water Fishery.—The rivers, lakes and other bodies of water inland also abound with fresh water fish.

In the Yalu, the part about Antung affords a good fishing ground. In the Sungari, the parts about Wulakai on the Upper reaches, about Sanchiakou and farther below about Sansing are the most fruitful grounds. The lake in Hulun is one of the newest grounds. Among the fresh water fish, the carp, gibel, trout, salmon, wels, *suzuki*, *tanago*, *yamame*, *higai*, river-shark, etc., may be counted. In summer, the catches are carried to the market, and in winter, they are forwarded even into the interior of Siberia. The main and branch streams of the Sungari are known as pearl grounds, and a good deal is still being put out.

Salt Industry.—Over the Yellow Sea and the Gulf of Pechili, there is little rain and the evaporation process goes on actively. Therefore, the sea water is brinier, and salt manufacture is conducted very extensively along the sea coasts. Along those of Yingkou, Kaiping and Fuchou, the salt gardens under management of Chinese government and private parties lie in almost an unbroken line. The sea water is put in the salt gardens by making use of the tide and wind-mills, and is left to evaporation by the sun. Salt industry is conducted vigorously also in the Kwantung leased territory. The yearly outputs vary according to years, but are placed at about 3,000,000 *koku*, of which about 700,000 or 800,000 *koku* is put out in the leased territory.

Salt belongs to the monopoly of the Chinese government. The salt monopoly system is not unified all over China, but is more or less different according to provinces. In the three eastern provinces, the system is fashioned much after the Japanese system. The government buys salt manufactured along the sea coasts and sends it to different centres to sell it at the specified price. This system is comparatively well-organized. The import of no salt produced outside Manchuria is permissible into Manchuria. Smuggling is liable to severe punishment. Salt produced in Manchuria is debarred from export, except to Mongolia and the Jehol district. In the Kwantung leased territory, the area suited to salt manufacture is estimated at about 2,400,000 *tsubo*, of which only one-half is now operated. The Japan Salt Manufacturing Co., the Oriental Development Co., etc., are actively interested. When the export of Kwantung salt to Japan and Chosen increases, the outlook of the Kwantung salt industry will appear more promising.

VI. Industry

Rapid Growth of Japanese Industries.—Manchuria is richly endowed by nature with vast possibilities in agriculture, stock-farming, forestry, mineral products including fuel, and other industrial materials. Still, owing to the infantile stage of the Chinese in industrial or technical lines, there are few industries worthy of the name outside oil-expressing, flour-milling and *samshoo*-distilling. Even as to daily necessaries, the majority of them have had to be imported from abroad or South Manchuria. However, as the sphere of the Japanese activities has expanded in recent years, the abundance of raw materials and fuel (coal) and cheap labor have been turned to most account, and it has resulted in the establishment of a long list of industries, and thus the dawn of an industrial colony seems to be breaking on the Kwantung leased territo?y.

Chemical Industry.—Chemical industry, because of any supply of coal lying at hand and also because of the cheap electric power from the Mond gas producer plants being available, appears destined to thrive at and about Fushun. Actually, at the sulphate of ammonia factory attached to the Mond gas producer plant under management of the South Manchuria Railway Company, calcium carbide, calcium cyanide, sulphate of ammonia, etc., are being put out in considerable quantities. At Dairen, there are the Electro-Metallurgical Co., Manchuria Barium Industry Co. and Solite Manufacturing Co. (for the manufacture of solite, a paint made from soya beans). At Antung, there is the Manchuria Blasting Powder Factory. It is a pity that, despite the repeated experiments made for the production of soda from the plentiful Kwantung salt, the proposition has not yet assumed a tangible shape. In lines of oil and fat industry, the Dairen Oil & Fat Industry Co. is turning out hardened oil, etc., from soya bean oil, the Manchuria & Mongolia Development Co. dealing in gelatine, animal oils, and vegetable oils. In addition, the Manchuria Paint Co. is also located at Dairen.

Manufacturing Industry.—Bean milling ranks foremost in manufacturing industry. Bean oil is indispensable to the Chinese as a food and for cooking. Bean milling is best developed at Dairen, which is now possessed of sixty mills. In the interior of the country, the old primitive system by which a few head of mules or donkeys and a few hands do the work of expressing oil from beans is still found in vogue. Such is only a domestic by-industry. However, such extensive mills as use steam engines and express oil by hydraulic pressure are mostly found at Dairen. The Suzuki Bean Mill at Dairen is operated on the chemical extraction system which is the latest scientific method. The round-shaped cake left after the expression of oil weighs 46 *kin* a piece, which is the standard weight for export cake. In the fiscal year 1919, 19,693,000 piculs valued at Hk. Tls. 43,029,000 were exported to Japan. Bean meal, which is put out at the Suzuki Mill, is good for use as it is. Bean cake is used by the Chinese for cattle-feed, and by the Japanese as fertilizer. It contains a good percentage of nutriment sufficient to be made a food-stuff, and so the idea of converting bean cake into an article of food should not be pooh-poohed at as a fool's vagary.

The total outputs of the bean mills along the South Manchuria Railways in the fiscal year 1919 are placed at about 1,462,000 tons worth Y.99,800,000 in bean cake, and 151,000 tons worth Y.22,-650,000 in bean oil. Bean oil chiefly serves as material for the making of soap, oleomargarine and paints in the United States. Bean cake is exported principally to Japan. Distilling industry comes next in importance to bean milling in Manchuria. The liquors used by the Chinese in Manchuria are chiefly *samshoo* (distilled from *kaoliang*) and *huangchiu* (fermented from millet). *Samshoo* is the most popular drink and bears a slight resemblance to whisky. Fengtien (Mukden) and Liaoyang and their vicinities are the centres for *samshoo* distillation, although distilleries lie scattered all over the country. The aggregate yearly output of *samshoo* is estimated at Y.13,000,000, and no inconsiderable amount is exported to China. Recently there have been quite a number of people starting the manufacture of *sake* (a Japanese drink fermented from *sake*), *miso* an article of food, a necessary adjunct to breakfast in Japan which is made of beans, salt and *koji* (fermented rice), and *soy*. Japanese-made *soy* is superior to the Chinese-

made article in quality, and is believed to grow in demand amongst the Chinese.

The S. M. R. Co. general laboratory has invented an improved process of fermentation, and also how to manufacture calcium lactate from the grounds of *kaoliang* left after *samshoo* has been distilled.

Next, ceramic industry is still another indigenous enterprise that holds out a good promise. Manchurian soil is suited to ceramic industry. There are the Continenal Ceramic Factory at Fengtien (Mukden), the Asia Ceramic Factory at Kungchuling, the East Asia Brick Kiln at Dairen, and the branch kiln of the Yingkou Brick Kiln at Choushuitzu, in addition to like plants of more or less scale at Anshan, Kaiyuan, Changchun, Antung, Liaoyang, Ryojun (Port Arthur), etc. Most of these put out bricks and fire bricks. There are further numberless Chinese bricks kiln of modest scope.

South Manchuria, especially the Kwantung leased territory, abounds in limestone material for cement. The Onoda Cement Factory and the Dolomite Cement Co. are at Choushuitzu close to Dairen, and also a cement company is at Fengtien (Mukden). These factories have been doing prosperous business as the railway towns along the S. M. M. Co. lines have grown at a good pace.

As plenty of silicious rock is found to be glass-making material, there are at Dairen, in addition to the S. M. R. Co. Ceramic Experimental Institute, the East Asia Glass Factory and the Dairen Glass Co. The utilities of glass and glassware are not yet universally known among the Chinese inhabitants of Manchuria, but their manufacture is promising. For instance, the Ceramic Experimental Institute above mentioned has achieved satisfactory success in the manufacture of windowpanes and hollow ware both in quality and as a business venture, and before long a glass manufacturing company will be organized on an extensive scale under private management. In addition, with the war-time boon in iron foundry business, the Dairen Crucible Manufacturing Co. was brought into being. Then, pottery business is still another line of industry that promises to pay.

The pottery division which belonged to the Ceramic Experimental Institute was transferred to the China Ceramic Co. on October 1, 1920. Among those engaged in gathering clay and other raw material, there are the Japan-Manchuria Pottery Co., Manchuria Pottery Co., etc. Wulakai in Kirin province has enjoyed the name of a fine pottery centre from old times.

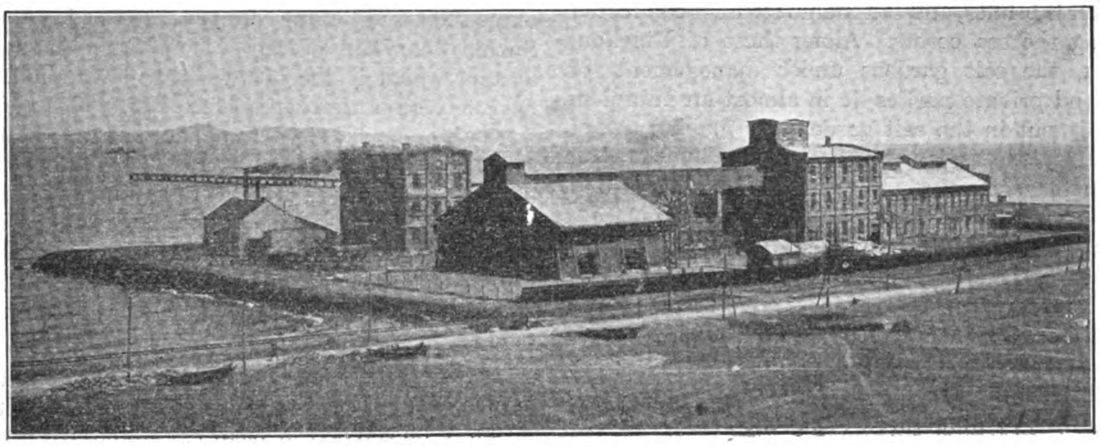
(To be continued.)

SOYA BEAN OIL

By Mr. M. Nakao & Mr. S. Ikebe (of the General Laboratory of the South Manchuria Railway Co.)

BEAN oil is made from soya (Manchurian) beans (glycine hispida maxim) which originated in China and have been transplanted in Japan, Chosen (Korea), India, etc. Manchuria is highly suited to the cultivation of beans, the aggregate production being estimated at between 12,000,000 and 18,000,000 *koku* (1 *koku* is equivalent to 4.96 bushels), of which, half is consumed by the bean mills, and the oil exported. The mills at Dairen consume over 500 tons a day.

Naturally, the study of beans, how to improve their breeds and unify them, and foretell deterioration in quality while in storage are matters of great interest and importance. The authors have been engaged in the study of these problems, but have not yet been able to complete them. The information in this article is only part of the results of their investigations.



South Manchurian Railway's Experimental Bean Mill

Classification of Beans and Bean Oil

The quality of oil depends on the class of beans from which it is made, and also on the process employed. The soya (Manchuria) bean has 214 species, which may be grouped under the following heads :—

Hairy : Hairless : (1) Flat, (2) Roundish, (*a*) Yellow, (*b*) Green, (*c*) Black, (*d*) Brown, (*e*) Greenish-Yellow, (*f*) Spotted.

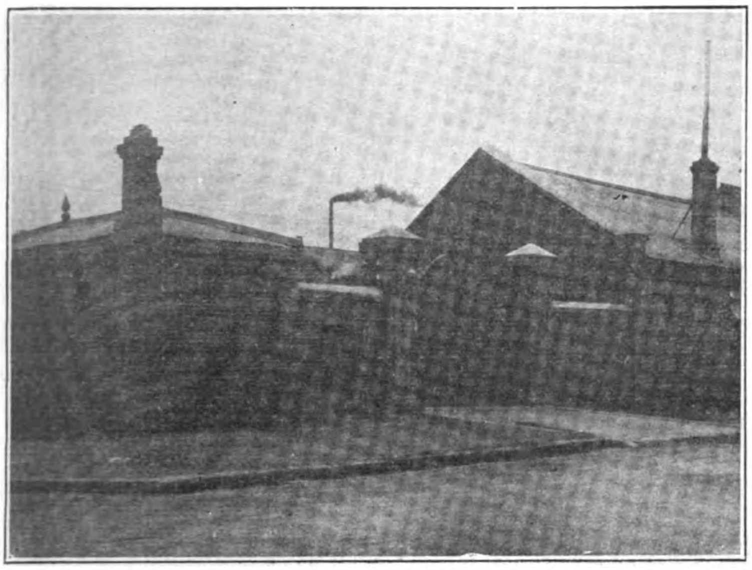
These may be classified according to colors and ingredients and tabulated according to analysis, as follows :

	Oil	Albumen
Deep blue	19.20%	45.55%
Blue	18.79%	43.13%
Light bluish yellow	20.81%	40.25%
Bluish yellow	19.95%	40.45%
Yellow	19.88%	42.54%
Whitish yellow	19.93%	41.81%

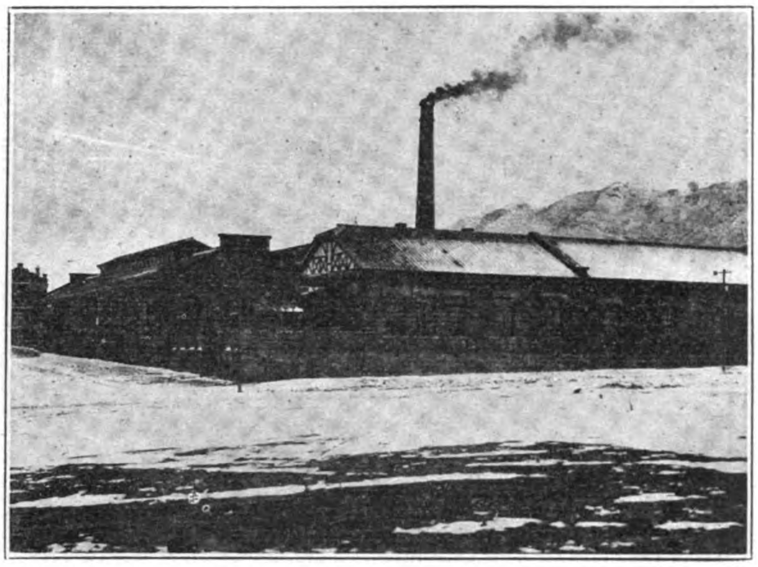
The above will show that the light bluish yellow kind contains the highest percentage of oil, and the blue the lowest percentage. All the yellowish kinds have much the same percentage of oil. Again, the results of analyses of various kinds of Manchurian beans confirm the above table in showing that the yellowish varieties contain the highest percentage of oil, blue a lower percentage, and the black, the lowest percentage. Allowances must be made for more or less variation according to places of production and in time of analysis. However, generally speaking, the yellowish varieties are the commonest and yield the greatest percentage of oil.

The results of the analysis are as under :—

Beans		Moisture	Crude albumen	Crude fat	Hydroc..rbon	Crude fibre	Ash
Whiteeyed	..	9.87	37.23	9.37	24.03	5.11	4.39
,,	..	12.34	37.35	17.59	23.36	5.12	4.36
Chinyuan	..	9.70	37.74	19.33	24.41	5.05	4.77
Blackeyed	..	10.90	37.51	19.64	23.12	5.11	4.53
Yellow	..	9.11	39.90	17.59	24.27	4.92	4.21
Blue ..	..	12.64	36.47	16.23	25.08	4.89	4.69
Black .	..	10.74	35.32	15.80	24.43	5.96	4.00



Kodera Bean Mill, Dairen



Works of the Dairen Oil and Fat Industry Company at Dairen, where the oil is hardened, and glycerine, etc., manufactured

Expression of Oil and Bean Oil

Bean oil was formerly used as a source of light and a greater portion mixed with sesamum oil for cooking purposes. In such times, native mills on small scale could fill the local wants. But, since the utilization of bean cake as fertilizer, the bean mills manufactured the cake as the primary object, the oil being a mere by-product. However, as bean oil found an extensive market in Europe and America, the oil and the cake have now an almost equal demand. The process of expressing oil consists in expression and in extraction.

I. Expression

Oil expression may be subdivided into the wedge, the screw and the hydraulic pressure system.

(*a*) Wedge Method: The wedge method has been in use in China from early times. A wedge is employed to express the oil by hand, very primitive, and takes a long time. It is said that by this method, a comparatively large quantity of oil containing a less quantity of impurities is obtained. (*b*) Screw Method: In this method, the screw takes the place of the wedge to save labor. (*c*) Hydraulic Pressure System: The hydraulic pressure system is the most advanced of all and mills operated on this system are on the increase.

II. Extraction Method

In the extraction method, a solvent is used for the extraction of oil from beans. By this method, the largest percentage of oil is obtained. However, the oil procured by this system is of a different color from what is obtained by expression, and is dealt in separately. The extraction process extracts almost the whole of oil, whilst the expression process leaves nearly half the oil in the cake. The following table will be of some interest :—

Shape Principal Mills	Bean Cake round Everywhere in Manchuria	Bean Plate oblong Kabalkin Mill, Harbin	Bean Meal in meal Suzuki Mill, Dairen
Maximum pressure per square inch of surface	600-700-lbs.	1,700,2,200-lbs.	By benzine extraction
Oil percentage to beans ..	9-10%	11.5-12.5%	14-15 %
Oil left in residue	7-9%	5-7%	2.5-3.0%
Moisture contained in residue	12-19%	10-13%	4-13%

Literature on Bean Oil (Produced in Manchuria)

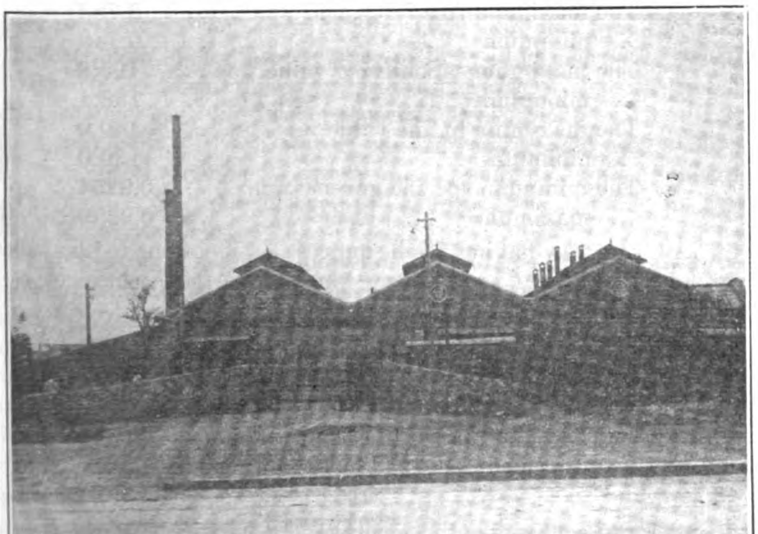
The study of bean oil has become popular with the increase in demand. There are a good number of books and articles written on this subject, giving the results of investigations made into the composition of beans and also their utilities. The following is a list of some of the more interesting writings on bean oil :—

Tsujimoto (in Vol. VII of 1904, Report of Industrial Chemical Society.)

Kametaka (in Vol. XXVII of 1906, Report of Tokyo Chemical Society.)

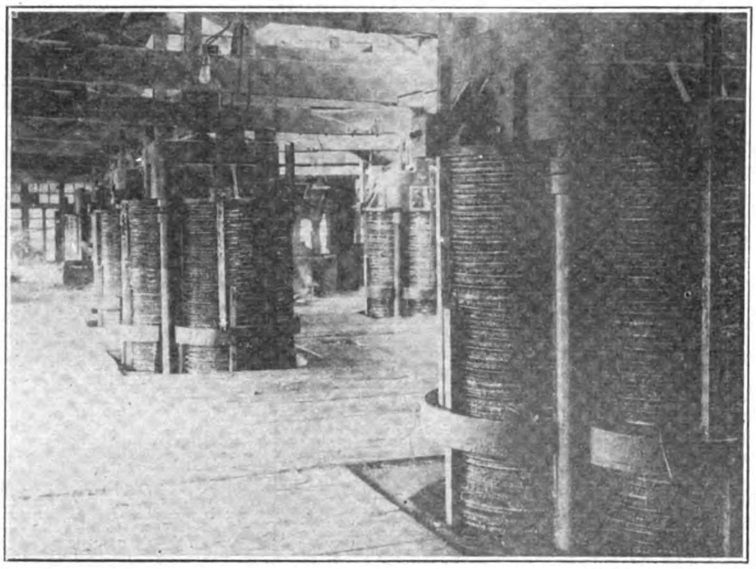
Nishiyama (in Vol. XI of 1908, Report of Industrial Chemical Society.)

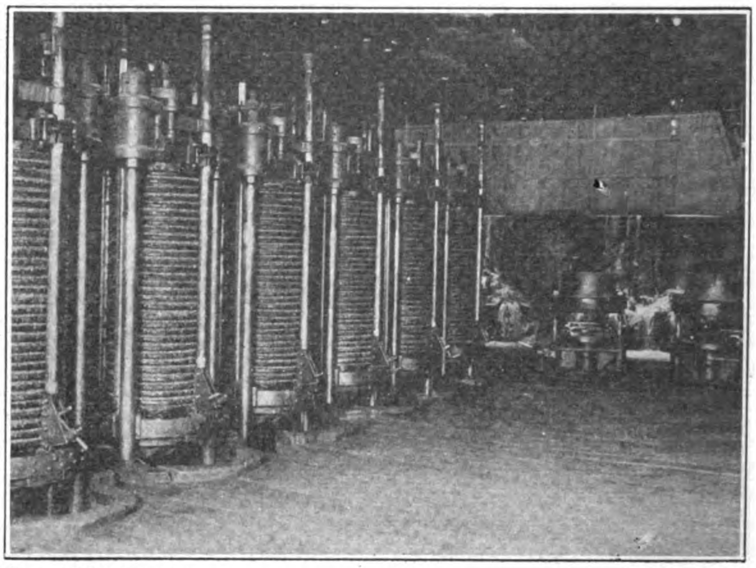
Uyehata (in No. 1, 1910, Report of S. M. R. Co. Central Laboratory.)



Nisshin Oil Mill, Dairen

Interior of the Nisshin Oil Mill, Dairen





Interior of the Santai Bean Mill, Dairen

Keimatsu (in Chem. Zeit, 1911, 8, 39.)
Okada (in Vol. 1, 1913, Report of S. M. R. Co. Central Laboratory.)
Nishiyori (in Vol. V, 1916, Report of S. M. R. Co. Central Laboratory.)
Sato (in Report of Industrial Chemical Society, 1919.)
Tanaka (in Report of Industrial Chemical Society, 1919.)
Uyeno (in No. 9, Report of Industrial Experimental Institute.)
Morawski and Stingl, De Negri, Fabris, and Schukoff.
W. Korentsehewski and Zimmermann ; Chem. Zeit. 1905.
Meister ; Chem. Rev. 1910.
C. Oettinger and F. Buchta ; Zeit. & Augen. Chem. 1911.
H. Matthes and A. Dahl : Tourn. Soe. Chem. Ind. 1911.
L. Settimi. Aun. Leb. Gebella, 1912-1913.
Brightmann ; Jon. Soe. Chem. Ind. 1919.
Charter A. Newhall ; J. Ind. Eng. Chem. 1920, etc.

In the above works and articles, Matthes and Dahl say that bean oil contains 94.95 per cent. of fatty acid ester, of which about 15 per cent. is saturated fatty acid, and about 80 per cent. unsaturated fatty acid. Olein acid takes up 70 per cent.; linolic acid 20 per cent.; and linolenic 6 per cent. Nishiyama claims that the unsaturated acid contains hypogene acid. Keimatsu says the presence of linolenic acid cannot be established. Tsujimoto doubts the presence of hypogene acid. Of bean oil, the percentage of non-saponifiable matter seems to widely vary according to places of production and oil-expressing methods. Dr. Riegel says that 0.15 per cent. of lechchin is contained. We have quoted above only a few fragments of the results of the ingredients of bean oil. They cannot be accepted as applicable to the quality of bean oil produced in Manchuria. Especially, as to the indices ascribed to Manchurian (soya) bean oil, opinions have differed. The indices given by Mr. Uyehata finds disagreement. Messrs Tsujimo and Mitsumaru aver that the value of Manchurian bean oil has been set too high.

The following is a table indicating the indices of the respective authors including our own :—

	Tsujimoto (15°)	Nishiyama (15.5°)	Keimatsu (15°)	Morawski & Stingl (15°)	DeNegri & Fabris (15°)
Specific gravity ..	0.9256	0.9242	0.9265	0.9270	0.9242
Freezing point ..	—	17° below zero	15°-16° below zero	—	8°-15° below zero
Saponifying value ..	192.6	192.4	190.0	192.9	192.5
Iodine value ..	132.5	134.4	132-135	122.0	121.3
Hehner value ..	95.7	95.1	94.2	95.5	—
Reichert Meissl value	7.29	0.55	—	—	—
	—	96.0	—	—	59.0
Refractive value ..	20° 1.4755	20° 1.474	Viscosity 9.0 Engler degree	—	—
Butter refractometer	20° 75.2	—	—	—	—

	Oettinger & Buchta 15°	Mathes & Dahl 15°	Authors 15°	Authors 15°	Authors 15°	Authors 15°
Specific gravity	0.9246	0.9240	0.9279	0.9289	0.9267	0.9278
Freezing point	8°–16° below zero	11.5° below zero	—	—	—	—
Saponifying value	192.4-194.0	192.3	190.0	191.0	192.3	190.8
Iodine value	132.9–135.0	131.3	131.8 Wijs method	132.0	137.7	134.8
Hehner value	95,8–96,0	94,07	—	—	—	—
Reichert Meissl value	0.45-0.59 —	Acid value 0.75 —	Acid value 0.57 —	Acidvalue 0.72 —	Acidvalue 0.18 —	Acid value 0.09 —
Refractive value	(20°) 1.47 50-1.4755	— —	Viscosity (Redwood) degree 274 (?5°)	Viscosity (Redwood) degree 274 (?5°)	Viscosity (Engler) degree 8.43 (25°)	Viscosity (Engler) degree 8.26 (25°)
Butter refractometer	—	—	72.5	72.5	71.8	71.8

The indices given in the above table have been obtained from only a few samples employed for experimental tests and furnish only a general idea. On this account, they are felt to be somewhat inadequate for all the varieties of Manchurian bean oil appearing on the market. Accordingly, in March, 1921, of three hundred odd bean mills at Dairen and along the South Manchuria Railways, 140 of the more important mills were selected, and samples of ordinary bean oil put by these plants were procured and subjected to a general test, particular attention being given to the color of the oil, which had hitherto been left neglected. This was done, because as an article of merchandise, the color standard must be observed, apart from the uniformity of quality from a chemical standpoint. Especially, in the tests to be passed on bean oil imported into America, its color forms an item of importance. It is laid down that no bean oil shall be darker, when 5¼-in. deep, than the mixture of either yellow (70) and red (8.0) or yellow (70) and red (9.0) of the standard colored glass. Bean oil manufactured in Manchuria seldom meets the above standard requirements. This point is held by us as one which calls for the serious study of the bean mill owners.

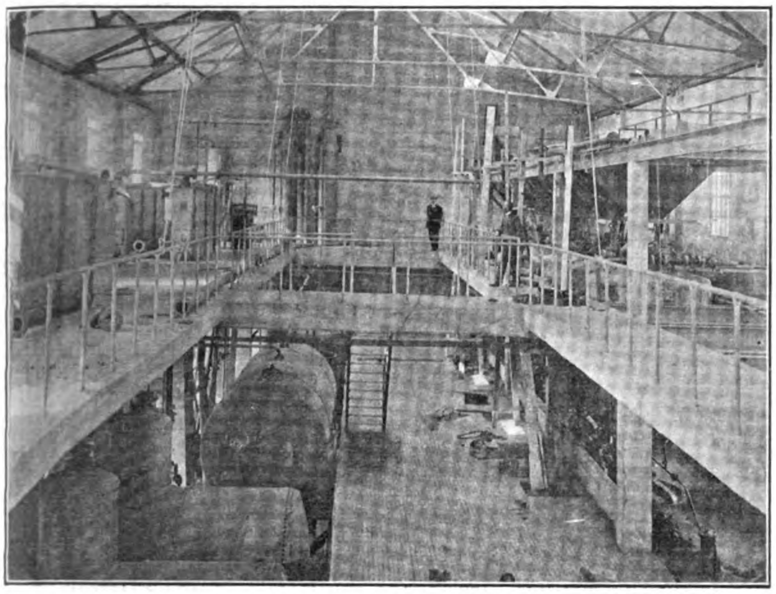
As a result of these exhaustive tests the following data was obtained :—

The maximum free fatty acid was	..	2.782
,, minimum ,,	..	0.140
The maximum saponifying value was	..	195.8
,, minumum ,,	..	188.4
The maximum iodine value was	..	140.0
,, minimum ,,	..	130.0
The minimum specific gravity was	..	0.9254
,, maximum ,,	..	0.9299

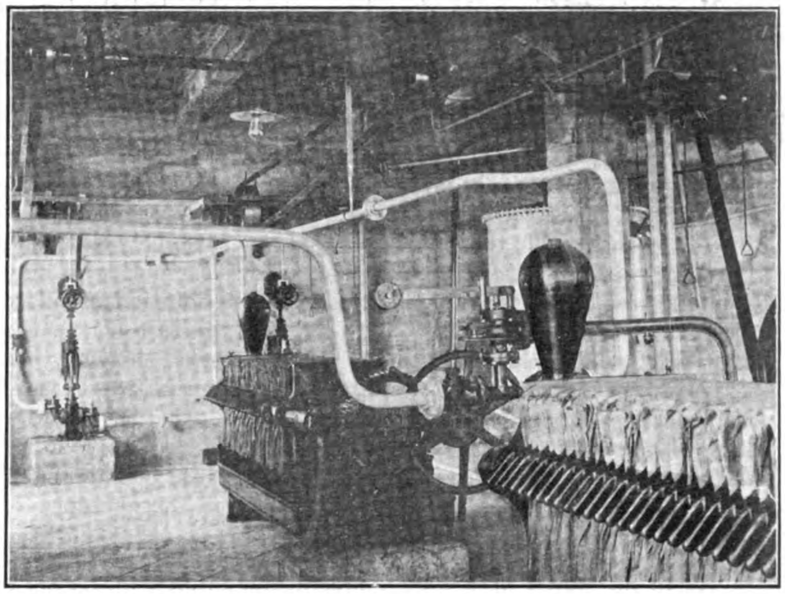
All samples having such indices as mentioned just above cannot be regarded as ordinary kinds. The general averages of all the samples are as under :—

Specific gravity	.. ..	0.9272
Free fatty acid	.. ..	0.4011
Saponifying value	.. .. ..	191.40
Iodine value	.. ..	134.44
Colour (2 inches deep) ; yellow	.. ..	59.18
red	.. ..	6.85

These figures give the general averages, which, in our opinion, may be accepted as the averages of the kinds of bean oil on the market. As to the color standards laid down by the United



Interior View of Extraction Room



The Fitter Presses

States, they seem rather severe for the bean oil now on the market, and appear more worthy of refined oil. In fact, if more than two inches deep, the American color standards would seem too dark.

Free Fatty Acid of Bean Oil

Free fatty acid in bean oil is looked upon as important as color, as the percentage of free fatty acid influences the price. Especially, which oil for export, the percentage of free fatty acid is feared to be prone to increase while in transit. Of course, the acid value of bean oil varies according to new or old beans, from which it has been made, and also according to the length of time that has elapsed after its manufacture. The older the beans the higher the acid value. Messrs. Mathes and Dahl say (in Arch. Pa rm. 1911, 249. 424-435) that experience has taught that the moisture in the atmosphere raises the acid value.

Again, Mr. Nishiyama says, in No. 11 of the report of the Industrial Chemical Society in 1908, that exposure to the sun is found to increase the acid value of bean oil. The same author calculates the rate of increase as: 0.55 per cent. of acid value in bean oil rises to 1.01 per cent. on exposure to the sun for thirty days, and to 4.63 per cent. after ninety days. The same author has then studied if the acid value increases or not because of the presence of residue in bean oil, and has learned that such presence produces little effect. According to a report prepared in April, 1921, by the Kobe branch of the Mitsui Bussan Kaisha on the cause of deterioration of bean oil in quality, firstly, a sample of bean oil adulterated with 1 per cent. of impurity showed that the acid increased by 1.5944 per cent. in the course of fifty days, and also that the rate of increase rose higher till the lapse of forty days; secondly, when mixed with 1 per cent. of sea water, the increase of acid was noted to be 0.479 per cent. in the course of fifty days; thirdly, when mixed with 1 per cent. of fresh water, the increase of acid was 0.3948 per cent. in the course of thirty days; fourthly, when exposed to the sun, the percentage of increase was 0.1128 in the course of twenty days.

The degree of acidification among the above four cases was in the order mentioned, and in the fourth case, but little effect was discernible. The authors subjected samples of bean oil manufactured afresh at the factory of the Dairen Oil & Fat Industry Co., Dairen, the qualifications of which were as follow, to the undermentioned tests: Specific gravity 0.92 at 15° C; free fatty acid 0.143 per cent.; saponification value, 190.7; iodine value 132.2; moisture, 0.173 per cent. When oil is filtered, free fatty acid is put at 0.14 per cent.

These samples were left in different conditions as designated on the next column for thirteen weeks, the free fatty acid having been examined and measured once a week in the meantime.

	Maximum free fatty acid	Rate of increased acid	Progress
Crude oil (2 litres) (Stored in the dark)	0.1936	3.68	No increase of acid noticed after the fifth week.
Filtered oil (2 litres) (Stored in the dark)	0.1936	3.68	,, ,,
Crude oil (exposed to the sun)	0.2079	4.93	The weather conditions prevented a regular examination and measurement, but after the tenth week, no increase of acid was observed.
Crude oil (500 c.c.) (Stored in exsiccator)	0.1798	2.84	Acid increased very slowly, ceasing to increase after the ninth week.
Filtered oil (500 c.c.) (Stored in exsiccator)	0.1798	2.84	,, ,,
Crude oil (500 c.c.) (Stored in exsiccator saturated with moisture)	0.2628	8.79	From about the fourth week, the oil began to thicken from the surface; this became more pronounced in the thirteenth week, the increase of acid going on incessantly.
Filtered oil (500 c.c.) (Stored in exsiccator saturated with moisture)	0.2766	9.41	As above mentioned.
Crude oil (2 litres) (Stored in a heated room from 50 c to to 60 c)	0.3100	12.16	In a day, most of the precipitation became dissolved, the oil turning clear; the constant restored after three weeks.
Filtered oil (2 litres) (Stored in a heated room from 50 c to 60 c)	o.2766	9.41	No increase of acid observed after three weeks.
When dry air was sent in	0.1936	3.68	Little change noticed; the constant restored after four weeks.

As regards the variation in the increase of acid when oil is kept at a high temperature, the oil was kept in a drier at 105° C. for different lengths of time, and the free fatty acid was examined and measured, the results being as follow:

Left for	Free fatty acid At beginning	Free fatty acid At end	Rate of increase of acid to its inherent acid
2 hours	0.163	0.166	0.19
,, ...	0.164	0.174	0.59
4 hours	0.140	0.194	3.86
,, ...	0.163	0.102	2.39
,, ...	0.164	0.205	2.5
,, ...	0.140	0.166	1.8
12 hours	0.143	0.286	10.0
,, ...	0.183	0.302	6.7

No constant of increase of acid was obtainable, but the longer the oil under test was allowed to stand, the greater was the increase of the free fatty acid. It will be noted from the above results of the tests that (1) when either crude oil or filtered oil is kept from contact with air as far as possible, for instance, in an exsiccator, the rate of increase of acid was not marked; (2) the rate of increase of acid was comparatively low also when crude or filtered oil was kept in the dark; (3) the same held true when dry air was sent in. In the case of (1), the increase of acid was extremely slow, and after nine weeks, the constant was restored. From this it may be inferred as effective in preventing the deterioration of oil in quality to minimize its contact with air. In the case of (2), the quantity of acid became constant after five weeks, showing that storage in the dark is more desirable than exposure to the sun. Again, when oil is kept in a humid atmosphere, whether crude or filtered, the oil will absorb the mositure with more or less avidity, causing the oil to thicken and also raising the rate of increase of acid. It is patent what a deteriorating effect the presence of moisture has on the quality of oil.

As to oil stored at a high temperature, filtered oil shows a smaller rate of increase of acid, compared with crude oil. Still, the rate of increase is unmistakably higher than in other conditions. Such a contrast is all the more striking according to the lengths of time kept at a temperature above 100° C. These are phenomena resulting from the dissolution of oil, and it deserves special notice that the process of dissolution goes on more rapidly in water of normal temperature. Next, any impurity contained in crude oil, how small it may be in quantity, when it acts catalytically, was considered as a cause of the increase of free fatty acid, and some crude oil with all its impurities and some filtered oil were left untouched for a long time, to determine their respective acid values.

The above mentioned both samples were stored in the dark, and if any precipitation was found to settle, it was shaken well, and then a sample was obtained for examination and measuring.

	Free fatty acid		
	In crude oil	In filtered oil	Rate of acid value
At beginning ..	0.2484	0.2000	1.5 : 1
After 4 weeks ..	0.4703	0.2143	2.2 : 1
After 8 weeks ..	0.8783	0.2282	3.9 : 1
After 12 weeks ..	1.1756	0.2351	4.9 : 1

According to the above, oil, when once filtered, compared with crude oil, shows little increase in the free fatty acid. On the contrary, in the case of crude oil, at the end of 12 weeks, the quantity of acid is found to rise to fivefold, perhaps due to a catalytic solution. For this reason, when bean oil is to be stored in a large quantity for a long period, it ought first to be cleared of what impurities are contained by filtering.

Moisture and Bean Oil

We have learned by experiment that the dry air affects bean oil just a little, and that the moist atmosphere is prone to cause deterioration in the quality of bean oil. Again, we have brought some bean oil on sale on the market into contact with dry air after the oil has been filtered, and also into contact with moist air after letting the air pass through water. These experiments have been conducted in order to see what effect, if any at all, may have been produced on the saponification value and also iodine value.

It has been found that dry air does not cause any change in the oil, while, on the contrary, moist air increases the acid value, causes the oil to thicken in the fourth week, makes it more turbid in the fifth week, cause it to emit an acidifying smell like the odour of bird-lime and increases the settlings from the seventh week, and in the tenth week, the decomposing process goes on so actively as to make it difficult to obtain any two samples of the same quality.

	Moisture	Free fatty acid	Saponification value	Iodine value
Bean Oil	0.141	0.4426	190.8	134.3
After dry air has been sent in for five weeks	0.141	0.4426	190.2	134.3
After moist air has been sent in for a week	0.3360	.4444	193.4	133.4
After moist air has been sent in for five weeks	0.345	0.5255	191.4	131.2
After moist air has been sent in for ten weeks	0.606	0.6274	190.3	132.2

The indices for the samples of bean oil subjected to the test are as under:—

	Saponification value	
At beginning	191.0	132.7
Stored in the dark	190.8	132.8
Stored in dry air	191.0	132.6
Stored in saturated moisture ..	191.2	135.0
Stored in hot air	191.0	133.2
When dry air is sent in . ..	190.7	132.5

From the above, the saponification value of bean oil is affected but little in case of an increase of acid being noted or otherwise. On the other hand, on the whole, the value is observed to increase when the oil under test is subjected to a high temperature or is brought to contact with moisture. These results contradict the conclusion drawn by Messrs. Mathes and Dahl who say from experiments that moist air always lowers the iodine value. This point awaits further investigation.

Receptacles and Bean Oil

Nothing has yet been said about the effect of the receptacle, in which bean oil is packed, on the appearance of the contents.

However, when bean oil is kept in a glass vessel, which is liable to generate alkali by solution, the free fatty acid is known to decrease in value when left therein for some time from the original quantity.

Next, some kinds of receptacles get eroded through the impurities in the oil, threatening at times to deteriorate the quality of the oil. In our cases, the samples have been obtained from bean oil on the local market, packed in oil tins. In order to ascertain whether or not any change will take place in the amount of the free fatty acid, when stored in a glass bottle and also in a tin can, the oil in the two different kinds of receptacles has been left to stand for eleven weeks, but no change has been indicated in the amount of fatty acid, as shown under:—

	In glass bottle (1 litre)	In tin can (about 1 litre)
Free fatty acid at beginning ..	0.4986	0.4986
After one week	0.4979	0.4979
After five weeks	0.4978	0.4978
After ten weeks	0.4978	0.4978

Next, 1 litre of ordinary bean oil on the market has been put in three different kinds of receptacles (A) a galvanized metallic vessel, (B) a vessel made of iron plate, and (C) a vessel made of tinplate. At the close of each week succeeding, the oil has been examined, giving the following data:—

		Free fatty acid	Saponification value	Iodine value	Ash	Remarks
At beginning ..	..	0.7449	191.9	132.9	0.039	Moisture 0.107; Specific gravity 0.9264
At end of 1st week	..	0.7746	—	—	—	
	Vessel A	0.9192	190.9	131.8	0.04	No special metallic reaction shown in ash
	Vessel B	0.7606	190.3	132.6	0.035	,,
	Vessel C	0.7746	190.3	132.7	0.04	,,
At end of 2nd week	..	0.7883	—	—	—	
	A	0.6777	190.8	132.3	0.04	,,
	B	0.7381	189.6	132.9	0.04	,,
	C	0.7883	190.8	131.5	0.04	,,
At end of 3rd week	..	0.8460	—	—	—	
	A	0.6912	190.4	132.3	0.045	,,
	B	0.7380	190.1	132.0	0.038	,,
	C	0.8022	191.8	132.3	0.040	,,
At end of 4th week	..	0.8714	—	—	—	
	A	0.6569	190.7	132.3	0.048	No special metallic reaction shown in ash. Specific gravity, 0.9264
	B	0.7469	191.9	132.8	0.04	,,
	C	0.8443	191.9	132.1	0.039	,,

In the above tests, the bean oil used as standard showed an increase in free fatty acid from 0.7449 per cent. at the beginning to 0.8714 per cent. at the close of the fourth week.

Next, looking over the samples of bean oil kept in the three different kinds —A, B, and C—the contents of A indicated a decrease in free fatty acid ; those of B gave a like result ; and, as to those of C, no change was observed. In the case of A (a vessel made of galvanized metal), the surface was noticed to come off gradually as weeks went by, producing a precipitation, chiefly zinc. This decrease of the acid value, as instanced in the above table, is now under investigation. It is perhaps due to the fact that the free fatty acid has combined with the metal dissolved by electricity and has formed a salt. In fact, the coming off of the zinc seems to bear out such theory. Especially, the change of color of bean oil is more notable, as is denoted under :—

Bean Oil, 2 inches deep, measured by the Robibont Tintmeter

	A (galvanized metal)		B (iron plate)		C (tin plate)	
Standard glass	Yellow	Red	Yellow	Red	Yellow	Red
Bean Oil for test ..	61.2	7.0	61.2	7.0	61.2	7.0
At end of 1st week ..	62.2	7.0	81.4	4.6	57.5	6.8
2nd ,, ..	64.1	6.6	110.4	1.3	60.5	6.8
3rd ,, ..	62.2	6.5	118.0	1.6	60.2	6.6
4th ,, ..	62.2	6.5	120.2	1.6	57.8	6.6

It must be noted that the above data have been obtained as the result of only one experiment, whilst further experiments ought to be conducted to confirm the same. In the cases of A and C, little change has been observed, a tendency of fading even being noticed. On the other hand, with B, the color has been found to darken perceptibly.

Precipitations and Bean Oil

It is well known that the storage of bean oil expressed afresh produces a precipitation. In ordinary circumstances, the precipitation is put at 1 per cent. of the storage amount. We left bean oil just expressed in a long glass tube. The floating matter was slow to settle, and it took about four weeks for it to get practically precipitated, and, at the close of the fifth week, the oil became a clear liquid of uniform color. The settlings amounted to 1.26 er cent. of the dimensions of the oil, and, if dried, they were found to be 0.09. When the oil is freed from the settlings, no further precipitation is formed unless the oil contains water or other impurities.

The settlings have been obtained from the Nisshin Oil Mills, Ltd., Dairen (Mr. J. Furusawa, managing director) and been subjected to analysis, the results of which being as follow :—

Water	14.05
Ether lixivium	46.98
Crude albumen	2.75
Other organic matters	32.65
Ash	3.57

In order to neutralize 10 grammes of bean oil, 9.96 grammes of caustic potash is required. If this is included in the calculation as olein acid, the oil amounts to 50.18. About half the settlings consists of fatty acid ; the other half consists of water, minerals, albumen and other impurities, which make factors to lower the quality of bean oil. As already stated bean oil, when filtered and free from the settlings, is less liable to get deteriorated than crude, oil, and on this account, for the storage of bean oil, the removal of these settlings is necessary.

Conclusion

We may add that the 140 samples of bean oil, above mentioned were obtained from the bean mills without the mixture of any other substance. However, there were sixteen kinds suspected of the mixture of some blue bean oil.

The results of gaging by the tintmeter are as follow :

	Blue bean oil		Ordinary bean oil	
	Yellow	Red	Yellow	Red
Maximum ..	187.5	8.6	55.0 or 91.5	12.0 or 8.8
Minimum ..	109.0	1.6	23.0	5.75
Average ..	106.8	4.4	59.18	6.85

The above table will serve as guide to deciding whether or not a sample of bean oil is an ordinary kind or blue bean oil. In the case of an ordinary kind, the yellow seldom rises above 70. What is near 100 may be regarded as an inferior kind and wears a dark color.

As to the chemical indices, such as denoting :—

Specific gravity	0.9272
Free fatty acid	0.4011
Saponification value	191.04
Iodine value	134.44

may be accepted as ordinary kinds.

In bean oil, the free fatty acid markedly increases to the end of the fifth week after its expression, but thereafter the rate of increase is observed to be very slow except under special circumstances. The chief factors of the increase of the free acid are moisture, a high temperature and precipitates. Bean oil which has been eliminated of these impurities shows a less marked change.

Speaking of the receptacles, in which bean oil is to be packed, some of them will cause more or less discoloration. An iron vessel, which is rusty, is the worst and should be carefully avoided. When bean oil is to be stored in a large quantity, care should be given what kinds of vessels they are to be kept in. Next, the removal of all impurities and water is the most important. In conclusion, we are pursuing our experimental study of bean oil and also how to decolorize blue bean oil or such as has some of it mixed, and also how reduce the acid value of such as has an excess amount of free fatty acid, and we may have an opportunity to publish the results of our further investigations.

Japan's Condensed Milk Industry

THE condensed milk industry in Japan, like so many other enterprises which found their reason for being in the prosperity of the war period, fell into evil days after the armistice and has as yet been unable to recover from its difficulties.

Before the war the condensed milk industry in Japan was very insignificant. Naturally so, because, there were very few cows to supply any reasonably adequate quantity of milk for the factories. The greatest part of the condensed milk used in Japan came from Europe and America, only 30 per cent. of the consumption being produced in the domestic factories.

Shortly after the war began, imports fell off and demand increased abroad. In order to build up the primitive industry the government granted many exemptions from taxation to con lensed milk companies. In 1915 and 1916, therefore, it began to grow, and in 1920 there were more than 30 factories in Japan.

Comparatively Great

Even at the height of the war prosperity production was insignificant compared to the European or American industry, but considering Japan's lack of pasture grass, and milch cows, it was comparatively great.

In 1912 production was 2,113,290 *kin*, growing as follows : 1914, 3,188,587 *kin* ; 1917, 7,538,560 *kin* ; 1918, 10,821,043 *kin* and 1919, 16,902,994 *kin*.

From 1914 to 1919 the increase was five-fold, but from 1920 business has fallen off, and production consequently decreased and the future prosperity of the whole industry is extremely problematic.

Assisted Greatly

Only under the beneficient shade of the great war and by means of government protection was it possible to develop this industry to its past greatness. The government put an import

tax on foreign condensed milks of Y.5.50 per 100 *kin*, rescinded the domestic consumption tax on sugar, on all sugar used in condensed milk manufacture, and for three years from the date of establishment of a condensed milk company exemption from all taxation was granted. All these governmental aids were necessary to start the manufacture even, and it cannot be wondered at that its foundation is therefore decidedly weak.

Thirty Companies Now

To-day there are 30 companies engaged in producing condensed milk but their combined capital is not more than Y.5,000,000. Three companies, the Toyo Condensed Milk Co., capitalized at Y.1,500,000, the Kona Milk Co., Y.1,000,000, and the Boso Condensed Milk Co., Y.1,100,000, account for the greater part of this total. All the other companies are small, T.50,000 being a large capital for any one of them. It can readily be understood therefore that the equipment of these factories is decidedly inadequate and production can only be on a very small scale.

Each of these petty companies has registered dozens of trademarks and consequently there are many competing brands of condensed milk on the market for the limited domestic trade.

Double Competition

Not only is there cut-throat competition in buying but the principal raw material, milk, is extremely limited in quantity, so they are all competing against each other to get supplies on which tocontinue production. So the price of milk is driven up, and naturally their products must be sold at high prices.

Manufacturers of condensed milk proudly say that they are making very good condensed milk indeed, and that imported milks will soon be driven off the market by their efforts, but even at the time when foreign milk was most scarce in the domestic market, Eagle Brand (American), and Nestle's brands (Swiss) were not driven out by the home-made product.

Imports Resumed

Since the peace released European and American condensed milks for export, Japan has been importing more and more of them every year. The quality of the European and American manufactures is unquestioned abroad, while Japanese condensed milk exported during the war earned a poor name, and there is no market abroad now open to it.

Comparative Figures

Imports and Exports of Condensed Milk were as follows :

	Imports *kin*	Exports *kin*
1913	6,969,482	——
1918	3,233,976	1,307,350
1919	4,060,950	4,701,388
1920	4,701,388	——
1921, end June..	3,073,388	54,838

In 1920, from January to June inclusive, imports were 2,158,188 *kin*, and in 1919 during the same period they were 2,291,627 *kin*. It can be seen how imports have increased this year.

It can readily be seen that competition with American and European brands has dealt a terrible blow to the Japanese industry. Certainly the Japanese manufacturers cannot continue to produce as they have in the past, especially as now selling competition is getting worse and worse in the extremely limited home market, and export is dead.

Dividends Disappear

The profits of companies is getting lower and lower. The Toyo Condensed Milk Co. was organized especially to manufacture for export. At the height of its prosperity it made only Y.100,000 profit and the highest dividend it paid was 10 per cent. At the end of October 1920 there was no dividend declared and since that time things have been getting worse.

The Nippon Kona Milk Co. began business in 1917. It earned profits of Y. 80,000 at the height of its prosperity and paid a dividend of 8 per cent. The special production of this company is powdered milk. This is now coming from England, and the Japanese manufacture simply cannot compete with it in quality nor in price. Since last year the industry has shrunk to nothing, and most companies have closed their factories. Other companies have amalgamated their interests, while others are having their business adjusted.

Proper Moves

The Boso Condensed Milk Co. has been amalgamated with the Tokyo Kashi Co., under the name of the Nihon Condensed Milk Co., with a capital of Y.300,000. The Tokyo Condensed Milk Co., with a capital of Y.50,000, was amalgamated with the Morinaga Candy Co. These amalgamations are all movements in the right direction, but there are still many small companies in the business, and they are much upset about their future in the face of these amalgamations of bigger interests. It is thought they should all amalgamate into one company, decrease their expenses and improve their product, as well as labor for an improvement of dairying conditions in Japan. The manufacturers themselves look at their future in somewhat this same light, but unfortunately not all of them can be made to see the light of reason, so they go on competing in a ruinous manner, and are thus hastening the complete destruction of their industry.

German Activity in the N.E.I.

THE Germans have been successful in gaining contracts for locomotives, rolling stock, electrical plant, water pipes and bridgework in the Dutch East Indies. Owing to the depreciation of the mark valuable orders have gone to Berlin, and further important contracts are likely to follow if Herr Stinnes succeeds in his schemes for the financial penetration of the islands.

In view, however, of the close watch that merchants and contractors in Holland are keeping on prospective business in the Dutch East Indies, it is probable that the conditions under which Herr Stinnes offers loans for purposes of development there will be scrutinized carefully before acceptance. It will be remembered that he offered to advance £10,000,000 gold on condition that the authorities placed their 1922 contracts with the Rhine Elbe Union. In financial circles it is now reported that the sum offered has been increased to £30,000,000 gold.

Another offer by Herr Stinnes was that of a loan of several million florins to the municipality of Bandoeng, the stipulation being made that all municipal works should be entrusted to the same combine. The manager of an eastern trading syndicate with headquarters at Hamburg, who was well known in Batavia both before and after the war, in a recently issued brochure throws doubt on the future of certain Dutch Indian industries which were started a few years ago.

The Stinnes group is by no means restricting its activities to the building or assembly of rolling stock and the supply of iron and steel and similar engineering accessories. Its representatives are closely following every possible development that would lead to a demand for machinery or material.

It is practically certain that they will seek to arrange for the local manufacture of textiles, but it is more than probable that many years would elapse before the establishment of cotton mills in Java would seriously affect Manchester's exports to Insulinde.

Yet it would surely be fitting, says *The Times* (London), for British enterprise and finance to be associated with the production of such manufactures. There is reason to believe that the Dutch East Indian government would offer advantageous conditions. Terms that have been suggested include the purchase by the state of the whole of the first year's output at cost price plus 12 per cent., one million yards of material during each of three succeeding years at 12 per cent. above competitive prices, one million yards for three further years at a 10 per cent. preference in price, etc. In the tenth year one million yards at competitive quotations. After the tenth year the factory would stand on its own footing.

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THE FAR EASTERN REVIEW

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ENGINEERING FINANCE COMMERCE

遠東時報

上海仁記路第五號

HUGE ELECTRICAL EXPANSION IN JAPAN

JAPANESE ELECTRIC RAILWAYS

UNIVERSITY OF HONGKONG

SUPERSTRUCTURE OF N.E.I. RAILWAYS

RUSSIAN TIMBER TRADE

SULU ARCHIPELAGO

Vol. XVIII APRIL, 1922 No. 4

A. L. TAYLER.

SHANGHAI, PEKING, TOKYO AND MANILA

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

Type	To-day's Price	Price Jan., 1921	Reduction
2-2½-ton Standard Lorry Chassis...	**£730**	£ 997	***£267***
2-2½-ton Long Char-a-bane Chassis	**£750**	£1,007	***£257***
3½-4-ton Lorry Chassis	**£865**	£1,195	***£330***
3½-4-ton Char-a-bane Chassis ...	**£880**	£1,190	***£310***
4-ton Long Wheelbase Omnibus Chassis	**£950**	£1,200	***£350***
5-6-ton Lorry Chassis	**£960**	£1,320	***£370***

The prices given above are F.O.B. Guildford, England

WITH a view to stimulating trade and maintaining employment, we have written down our Stocks to a figure very much under cost, and this, with the wages reductions that will take place in the near future, has enabled us to sell our Chassis as from October 1st at the prices mentioned opposite.

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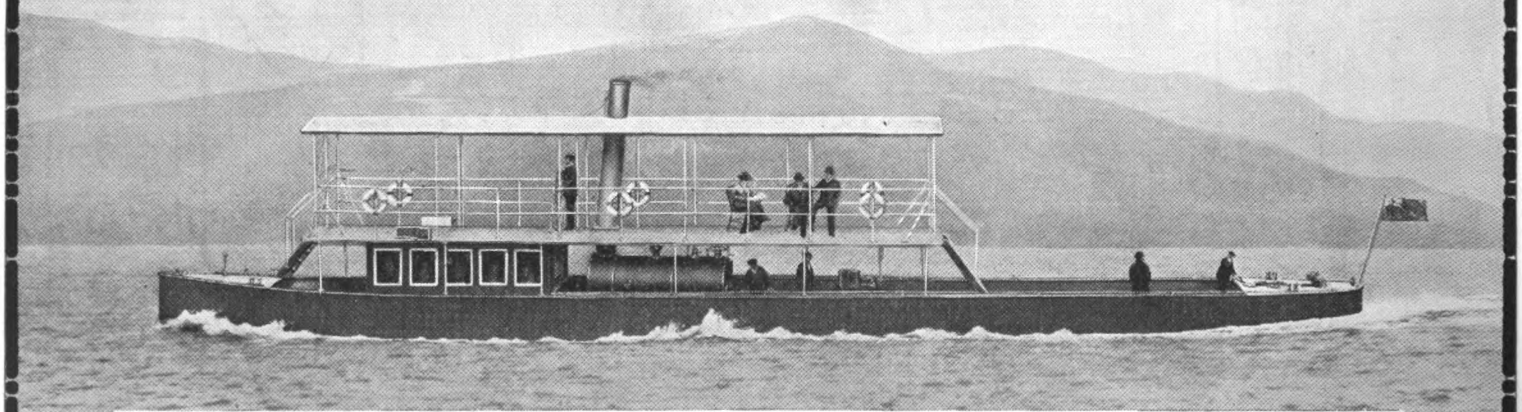

Length, 160-ft.; Beam, 24-ft. 6-in.; Draft, carrying 40 tons, 2-ft. 3-in.; Speed, carrying 40 tons, 15 Statute miles an hour, burning wood fuel only

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, APRIL, 1922 No. 4

Huge Electrical Expansion in Japan

A Survey of Actual Markets for Materials

1. Hydro-Electric Enterprises

By B.C. HUGINS

AT the end of 1920 there were in Japan 831 companies generating electric power from hydro-electric installations. The total capital investment in those companies was Y.1,369,400,000, and according to the investigations of the department of agriculture and commerce the total power licensed for development by these 831 companies was 7,404,000 kilowatts. The total power developed by operating companies was 1,254,000 kw. Enterprises licensed but not yet operating will develop another 2,756,000 kw., and licensed applied for but not granted call for the development of 3,394,000 kw.

Many of these concerns were established in the heydey of Japanese prosperity when it was a simple matter to raise capital, but since the slump of 1920 a large part of those not yet licensed have been abandoned. There were many good prospects among them, but also many weak valueless concerns.

The minister of agriculture and commerce in a speech at the end of 1921 announced that there were Y.1,600,000,000 then invested in hydro-electric enterprises, generating 1,340,000 kilowatts. In this speech the minister deplored the tendency to rush into new hydro-electric enterprises without considering the needs of the different parts of the country, and strongly urged his hearers to amalgamate their conflicting interests and thereby save many duplications of equipment which were only a costly drain on the finances of the nation.

Before this official appeal for amalgamations and annexations was made there had already been a growing tendency for the larger corporations to absorb the smaller concerns operating in or contributing to the power needed in their supply districts. Newly organized companies possessing valuable water rights were especially desirable purchases for old concerns, and the amalgamations carried out in 1921 strengthened the industry and the nation as a whole.

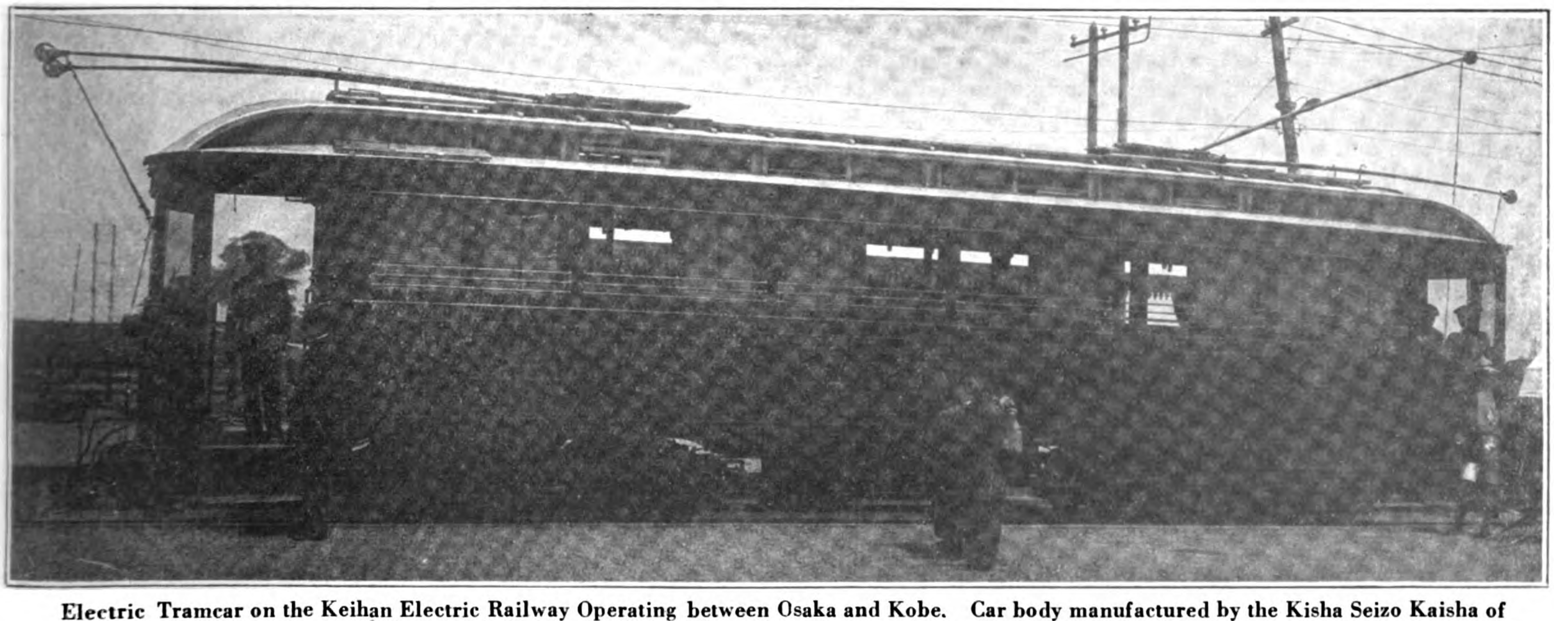
The Kwanto-Eastern District

In the Kwanto, the district of Japan covering Sagami, Izu, Musashi, Kosuke, Shimosuke, Hidachi, Kazosu, Shimosa provinces, east of the Hakone mountains, including the cities of Yokohama and Tokyo, is the most important population centre in all Japan, and the centre of the greatest power interests now operating.

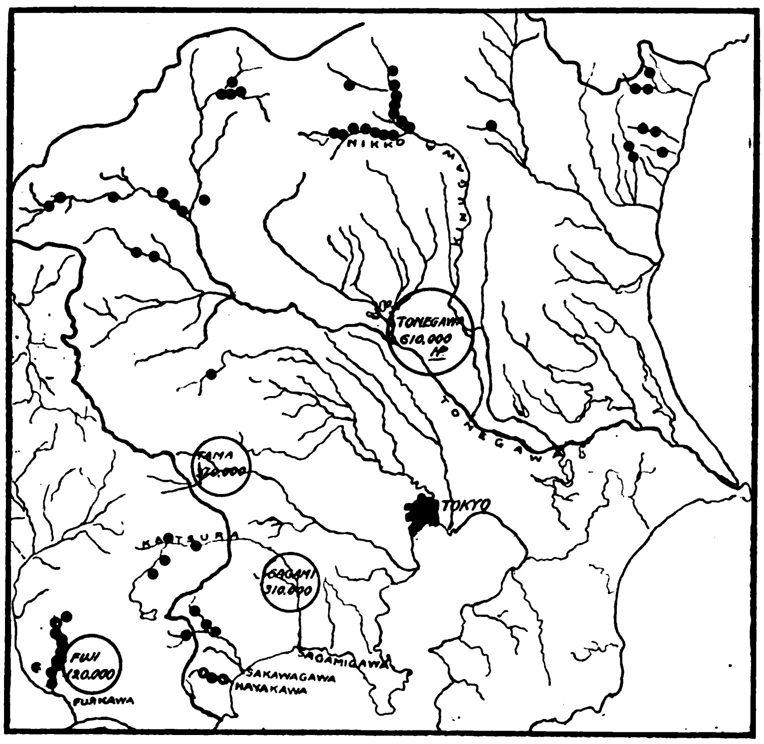
The most important water powers in this district are supplied by

1. The Tónegawa (river) and its branches.
2. The Sagamigawa.
3. Other minor rivers and their tributaries.

The Tonegawa water shed extends over the prefectures of Gunma, Tochigi and Saitama. There are more generating plants along this river and its branches than in any other part of Japan, and the generating stations are for the most part the largest in



Electric Tramcar on the Keihan Electric Railway Operating between Osaka and Kobe. Car body manufactured by the Kisha Seizo Kaisha of Osaka and equipped with four Dick Kerr Traction Motors, Type D-K, 9-C, 5 H.P.



The Kwanto District of Japan. Hydro-Electric Plants in Operation, 2,000 Kilowatts and upwards

the country. There are 133 generating stations in all, producing 612,000 kilowatts distributed by forty operating companies.

The principal companies operating in the basin of the Tonegawa are—

Company	River Basin	Power developed	
Kinugawa Suiryoku Denki	Kinugawa	55,440	kilowatts
Nikko Denki Kido (Electric Railway)..	Daiyagawa	180	,,
Shimotsuke Denryoku (Now Tokyo Dento)	,,	2,060	,,
Shimotsuke Denryoku (Now Tokyo Dento)	Kinugawa	3,650	,,
Takasaki Suiryoku Denki ..	Karasugawa	1,800	,,
Tonegawa Hatsuden Sho (Now Tokyo Dento)	Katashinagawa	22,556	,,
Gunma Denryoku	Agatsumagawa	28,963	,,
Kwanto Suiryoku Denki ..	Tonegawa	20,000	,,
Musashi Suiden	Jinryugawa	1,100	,,
Musashi Suiden	Arakawa	1,800	,,

The most important companies in the Kwanto to-day are the Tokyo Dento, the old Tonegawa Hatsuden Sho, now amalgamated with the Tokyo Dento, the Shimotsuke Denryoku, now amalgamated with the Teikoku Dento, the Takasaki (City) Suiryoku, the Kinugawa Suiryoku and the Musashi Suiden. These companies to-day have a generating capacity of 600,000 kilowatts, while their plans for the future call for the development of another 300,000 kilowatts. The Shikanuma Suiryoku Denki utilizing the waters of the Oashigawa has not yet completed an ambitious new project to supply some 20,000 kilowatts.

The other rivers in the Kwanto and some of the more important companies located along them are—

Arakawa :	Musashi Suiden.
	Kwanto Suiden.
Tamagawa :	Kwanto Suiden.
Sakagawa :	Sagami Suiryoku.
	Fuji Gasu Boseki Denryoku Ba.
Hayakawa :	Yokohama Denki, now Tokyo Dento.
	Odawara Dentetsu (Electric Railway.)
Agano River Basin :	Inawashiro Suiden.
Abukumagawa Basin :	Koriyama Denki.
	Tadami Gawa Suiryoku.
Fujikawa Basin:	Fuji Suiden.
	Hayakawa Suiryoku, which supplies power to the Keihin Denryoku Co. (Tokyo-Yokohama Electric Power Co.)

There are many other companies operating in the Kwanto but the centre of all of them is the powerful Tokyo Dento K.K. (Tokyo Electric Light Co., Ltd.) The Tokyo Dento has recently effected important amalgamations with the Nihon Dento, the Yokohama Dento and the Tonegawa Hatsuden Sho greatly increasing its capital to bring about the expansion of its boundaries and business. At the end of June, 1921, the authorized capital of the Tokyo Dento was Y.166,000,000. Its hydro-electric power plants generate 74,800 kilowatts, and its coal burning power plants add 29,700 kilowatts to that amount, making its total power generated, 95,500 kilowatts. It supplies 3,221,000 lights in and around Tokyo city, and sells 170,-000 kilowatts for motive power, partly purchased from others. This company to-day is the greatest supplier of electric power in all Japan, and as it is increasing its equipment and power all the time, its future is very promising.

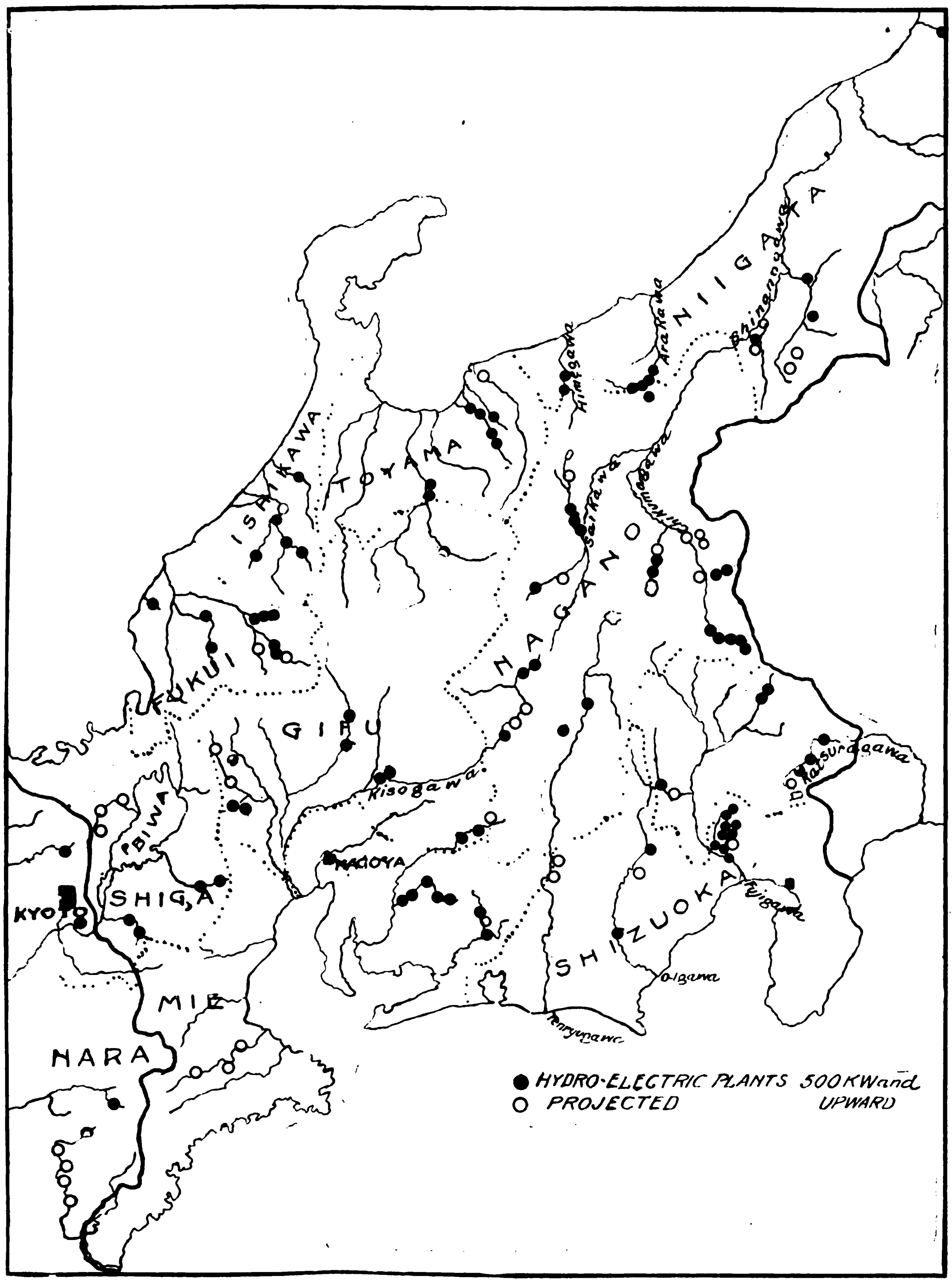
Since July, 1921, the Tokyo Dento has added to its organization the business of the Takasaki Suiryoku Denki, the Kumagawa Suiryoku, and the Nichiei Suiden and the Oshima Suiden, which, at first amalgamated with the Hayakawa Suiden, become the property of the Tokyo Dento when the Hayakawa company was absorbed in September, 1921. The Hayakawa before it fell into the hands of the Tokyo Dento was expanding its business in all directions, although its own construction plans were not yet completed. When its new power stations are completed they will generate 21,300 kilos from water power and 1,000 kilos from coal-burning plants. It was also rumored that the Tokyo Dento was contemplating the purchase of the Keihin Dentetsu (Tokyo-Yokohama Electric Railway), but this is denied by the action of the Keihin Dentetsu in purchasing the Gunma Denryoku which will generate 28,963 kilowatts when its plants are completed. By its purchases of the Takasaki Suiryoku it added 3,355 kilowatts, by the Kumagawa Suiryoku 2,386 kilowatts, and by the Hayakawa 6,100 kilowatts to its already large water power productive capacity. These companies also generalte small amounts of power from coal-burning plants, and all together they produce 15,000 kilowatts, a very welcome addition to the Tokyo Dento's supplies. Their combined capital before the annexation was Y 21,000,000.

Lately the Katsuragawa Suiryoku was also incorporated into the Tokyo Dento organization, adding another 33,000 kilowatts to its already great power supplies. The capital of the Katsuragawa was Y.42,000,000. It can be seen from these amalgamations that the water power of the Kwanto is slowly being concentrated under the control of the Tokyo Dento. The plans for future expansion of this company are very ambitious, and its constant reaching out for more and yet more power is a source of great anxiety to less favorably situated companies.

The Inawashiro Suiden has a capacity of 61,500 kilowatts, and it supplies power to Tokyo and Tokyo vicinity. Recently it entered into a contract of amalgamation with the Koriyama Denki and the Tadamigawa Suiryoku operating in the Abukawa (river) basin. The Koriyama generates 12,000 kilos, and the Tadami, which is still very young, supplies 500 kilos, but it has very valuable water rights which can be developed at very little cost. There are many small companies in the same river basin, the Fukushima Dento, Abugawa Suiryoku, Aiza Denryoku, etc., which will all probably be annexed to the Inawashiro in the near future.

The Kinugawa Suiryoku Denki K.K. is the third great company operating in the Kwanto. It generates 33,000 kilowatts, from water power and 13,000 kilowatts from coal. The Tokyo city electric bureau purchases 37,300 kilowatts from the Kinugawa.

These three companies are the great competitors for the business of electricity supply in Eastern Japan. But although there are



Map of Central Japan, showing Hydro-Electric Plants. ● In Operation, 500 Kilowatts and upwards, O Projected

many conditions existing to-day which tend to keep them apart, they will in all probability be combined in one large organization at no far distant date. Such a combination would be all powerful, in the Kwanto at least, and it would leave no room at all for any competitor to live in.

Central Japan, from Numadzu to Kobe

From the point of demand for power the Kansai district, centering around Osaka, is in no way behind the Tokyo district, the centre of the Kwanto. In Osaka and Kobe the demand for electric power is very great indeed, but water power is very scarce because there are no rivers in this district which have sufficient fall to make them valuable sources of power. Only in the basins of the Yodogawa and the Yamatogawa is there any available power. Practically all the water power which can be economically developed along those rivers has already been used up, consequently the Kansai is obliged to go outside its borders into the central districts, Chubu, the north-eastern part of Japan, the Hokuroku, and the Tokai, the district between Tokyo and Kyoto, in order to get power enough for its needs. These three districts are now competing for the business of the Kansai.

The Ujigawa Denki K.K. and the Daido Denryoku K.K. are the two great competitors for the business and power rights in this field. The Ujigawa Denki is a part of the earlier company the Kansai Suiryoku Co., and it still uses coal to generate power for most of its service. Its future prosperity has been threatened by the continual growth of the Daido Denryoku which has recently absorbed the Nihon Suiryoku, the Kiso Denki Kogyo and the Osaka Soden K.K.

The Ujigawa Denki, in competition, however, has made every effort to keep up with the Daido Denryoku, and it has entered into co-operative arrangements with the Nihon Denryoku, Wakayama Suiryoku, and the Kansai Denki, which was formerly the Nagoya Denki now annexed to the old Kansai Denki. These arrangements make the future of the Ujigawa, and the co-operating companies, secure against the growing power of the Daido Denryoku.

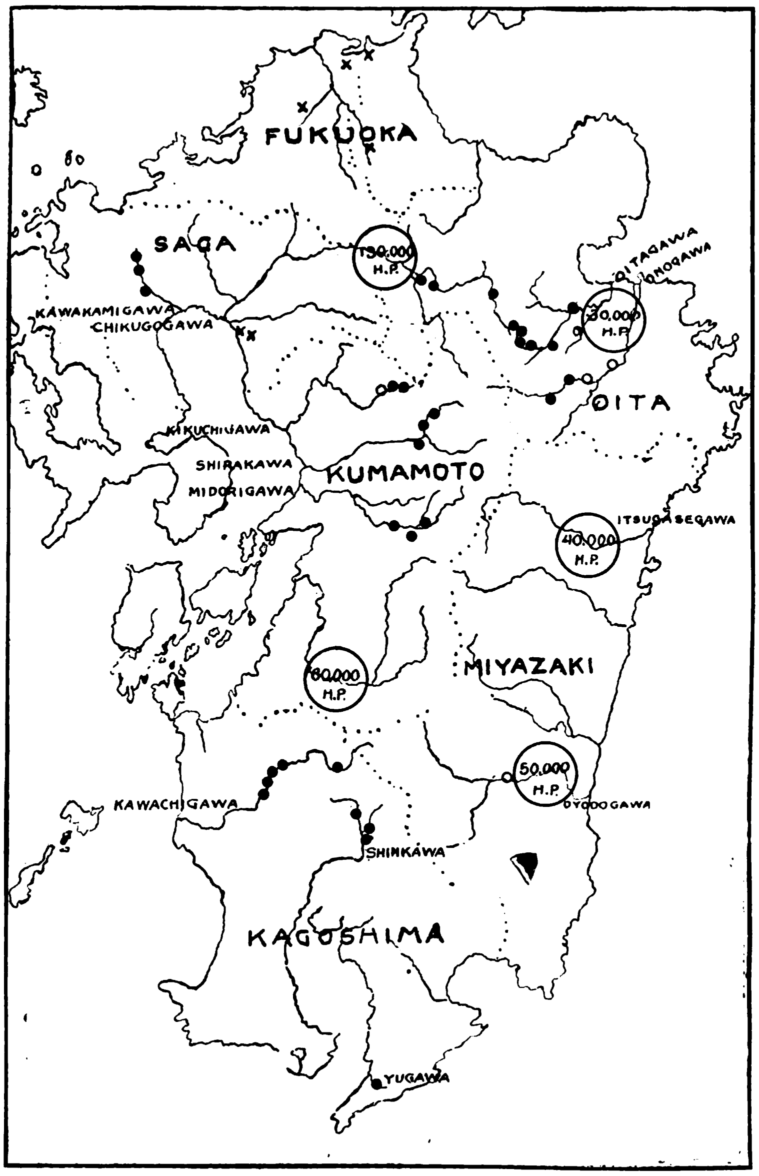
The following rivers capable of supplying power to generate more than 50,000 kilowatts are located in the Chubu, and the Hokuroku, and there are already many stations located on their banks:—

Kisogawa (Chubu)	73 sites.
Jinzugawa (Hokuroku)	42 ,,
Tenryugawa (Tokai)	77 ,,
Oigawa (Tokai)	17 ,,
Shokawa (Hokuroku)	30 ,,
Ibigawa (Chubu)	42 ,,
Kuzuryugawa (Hokuroku)	33 ,,
Yahagigawa (Chubu)	24 ,,
Saikawa (Hokuroku)	42 ,,
Joganjigawa (Hokuroku)	18 ,,

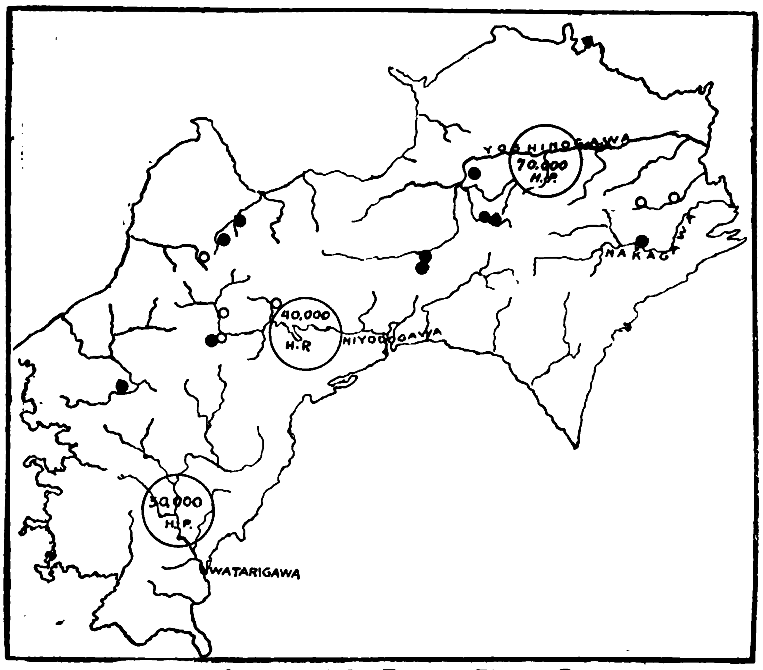
There are also many other small streams having potential power of less than 50,000 kilowatts, which added to those already given will produce 2,000,000 kilowatts, or about 27 per cent. of the total water power resources of Japan.

The important cities of Nagoya, Gifu, Ozaki, Hamamatsu, Toyohashi, Fukui, Kanazawa, and Toyama are all important industrial centres. But despite their potential value as users of power their needs have not assumed any very great proportions yet. Consequently it has not been possible to establish in these three districts, the Chubi, Tokai and Hokuroku, any great power companies having outlets in those cities alone. But now that the needs of Osaka are becoming more and more urgent the great Kansai companies are reaching out into them for power sites, and many plans are being considered for the development of their resources.

In the past few years the Kiso Denki Kogyo, Nihon Suiryoku, Osaka Soden, Nihon Denryoku, have all been established for the purpose of transmitting power to Osaka from these distant places. Excluding the Nihon Denryoku, the Daido Denryoku, with its capital of Y.100,000,000, promoted by the great electric power capitalist, Mr. Momosuke Fukuzawa, has absorbed all these com-



Map of Kyushu, showing Hydro-Electric Plants. ● Plants in Operation, 500 Kilowatts and upward; ○ Projected; X-Steam and Gas Power Plant



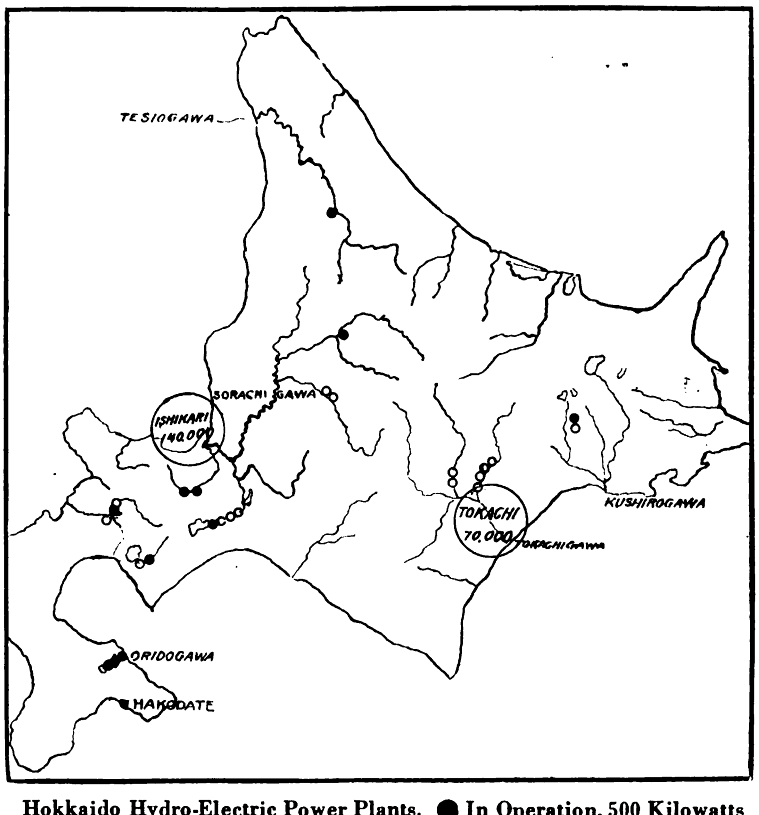
Map of Shikoku, showing Hydro-Electric Plants. ● In Operation, 2,000 Kilowatts and upwards; Projected. ○ In Operation, 500 Kilowatts and under

panies. The Daido has ambitious plans for absorbing other companies and extending its services ; it is said that the scope of these plans covers almost all the important industrial centres in Japan. Its power plants to-day are not producing much, only 24,800 kilowatts from the Kisogawa, Yahagigawa, and Kuzuryugawa. But this company has in course of construction power plants on the Kisogawa at Okuwa, and Suhara to generate 20,000 kilowatts, and at Tokushi, Komone and Oi on the Kisogawa, preparations are now being made to construct plants to generate 100,000 kilowatts more.

Scattered here and there through central Japan there are other companies which in the future will be in a position to generate 600,000 kilowatts. Osaka, Nara, Kobe and Wakayama are all in great need of cheap power, and are anxiously awaiting the extension of water power companies in their neighborhoods. It costs Y.12,000,000 to build the necessary transmission lines and stations between the Kisogawa and Osaka, but even this expense is not prohibitive, so necessary is power to these growing commercial centres.

The Kansai Denki and the Daido Dento are in the hands of the same group of capitalists. The Kansai Denki recently amalgamated the Taisho Suiryoku Denki, operating in Nara prefecture, capitalized at Y.10,000,000. The Taisho Denki is planning to build four power stations to generate 19,600 kilowatts on the Kumanogawa in Wakayama prefecture, and on the Yoshino Gawa in Nara prefecture. The Wakayama Suiryoku has also been annexed recently, because it is a particularly valuable organization for the supply of cheap power to Osaka city. It is reported that the Kansai Denki will soon annex the Itatorigawa Denki, the Mino Denki Hiryo, the Tenryugawa Suiryoku and the Yamashiro Suiryoku companies.

In Toyama and Ishikawa prefectures, in the Hokuroku district, there are many sites where enormous power can be developed. The Daido Denki is operating with the greatest success in these prefectures, and because of the capital relation between them the Daido and Kansai companies are now the greatest suppliers of power in central Japan. Perhaps they may even be able to realize their dream of obtaining control of all the important power sites remaining in the districts they are now operating in, and be able to extend their supply boundaries to Tokyo district.



Hokkaido Hydro-Electric Power Plants. ● In Operation, 500 Kilowatts and upward; ○ Projected

The plans for the expansion of these companies include the following distribution stations :—

Sakashita	Transformer	Station	250,000	kilowatts
One	,,	,,	80,000	,,
Hatotani	,,	,,	100,000	,,
Funatsu	,,	,,	200,000	,,
Iida	,,	,,	110,000	,,
		Total	740,000	,,
Tokyo	Transformer	Station	100,000	kilowatts
Kozu	,,	,,	20,000	,,
Hamamatsu	,,	,,	40,000	,,
Nagoya	,,	,,	100,000	,,
Kofu	,,	,,	10,000	,,
Osaka	,,	,,	260,000	,,

The Sakashita station will operate between Osaka and Nagoya a distance of 137 miles. The Funatsu station between Sabaya and Kaihei, and between Ono and Osaka stations, 212 miles. Between the Funatsu station and Nagoya is 108 miles, and from Sakashita to Tokyo is 187 miles, and from Nagoya to Kozu, 164 miles. From Nagoya to Sakashita and to Funatsu, then to Ono, and to Kozu is 309 miles. Adding all the lesser lines, the total transmission lines of these sister companies will be 1,400 miles long, and will cost Y.55,000,000.

In Toyama prefecture the authorities have been working since the spring of 1921 to bring about an amalgamation of the interests of many of the lesser hydro-electric companies owning power sites in important districts. Not all the companies have taken kindly to the official suggestions, but as a first step in the consummation of the plan the Oiwa Denki, the Fusegawa Suiryoku Denki, and the Aimoto Denki, decided to accept amalgamation with the interests of the Chuyetsu Hydro-Electric Co., capitalized at Y.1,600,000, and which is now, since the amalgamation, the most important water power company in Toyama prefecture. This amalgamation was completed in November, 1921, and it is expected to prove very advantageous to all the companies concerned.

Government Demand for Power in Kansai District

The imperial government department of railways is gradually electrifying its present steam lines and it requires more and more power every year. The whole cost of construction of the line between Tokyo and Kobe, the Tokaido, is estimated at Y.440,000,000. In the eastern part of this line the Tokyo Dento, and in the west the Ujigawa, the Nihon Suiryoku, the Kyoto Dento, and the Daido Denki are all planning future developments to take advantage of the railway's needs.

The railway department plans to electrify all the railways running out of Tokyo city for many miles into the country. The first lines to be constructed will be those between Yokohama, Ofuna, and to Yokosuka, and from Kichijoji to Jacioji, and from Kanda to Chiba, a total of 127.6 miles. There are already in operation in and about Tokyo 58.3 miles of electric railways, government owned.

In the suburbs of Osaka the Joto line, and a part of the Katamachi line, seventeen miles in all, will also be electrified. The total mileage to be converted about Osaka and Tokyo only is 144, and the work, as now planned, is to be completed in 1926. The government's often broached plan to convert the existing trunk line railways to broad gauge has practically been shelved during the past few years by this plan to electrify the principal railway lines.

To operate these 144 miles by electricity a supply of 70,000 kilowatts of power is needed. The Yaguchi power plant supplies 4,500 kilowatts, and the Tokyo city electric bureau, the Tokyo Dento, the Kinugawa Suiryoku, are all together supplying 10,000 kilowatts to the government lines about Tokyo. The line over the Usui Toge, near Karuizawa, gets 2,500 kilowatts from the Yokogawa power plant owned by the government railways. But when these plans for conversion are actually constructed the government railways must be in a position to supply all its own power, without purchasing from outside companies. This will be a blow to some of the plans of the Daido Dento.

The government railways are now completing a coal-burning plant at Akabane, outside Tokyo, which will cost Y.5,000,000 when completed. It will be finished this spring, and will supply 15,000 kilowatts. The railways are also planning the construction of a great 65,000 kilowatts hydro-electric plant on the Shinano river, the largest river in Japan, which will cost Y.45,000,000. If this is completed by 1926 the railway department will have a supply of 84,200 kilowatts of electricity water generated, as well as a coal-burning plant supply of 15,000 kilowatts, a total of 99,200 kilowatts. But only 70,000 kilowatts of water power need be developed, so this plan allows for an excess of 14,000 kilowatts which can be counted on in case of need.

The imperial railway department has completed the plans for the electrification of the Tokaido railway line, between Tokyo and Kobe. All estimates of cost, however, have not yet been made, and it is doubted if it will be possible to present the bill for the approval of this session of the diet.

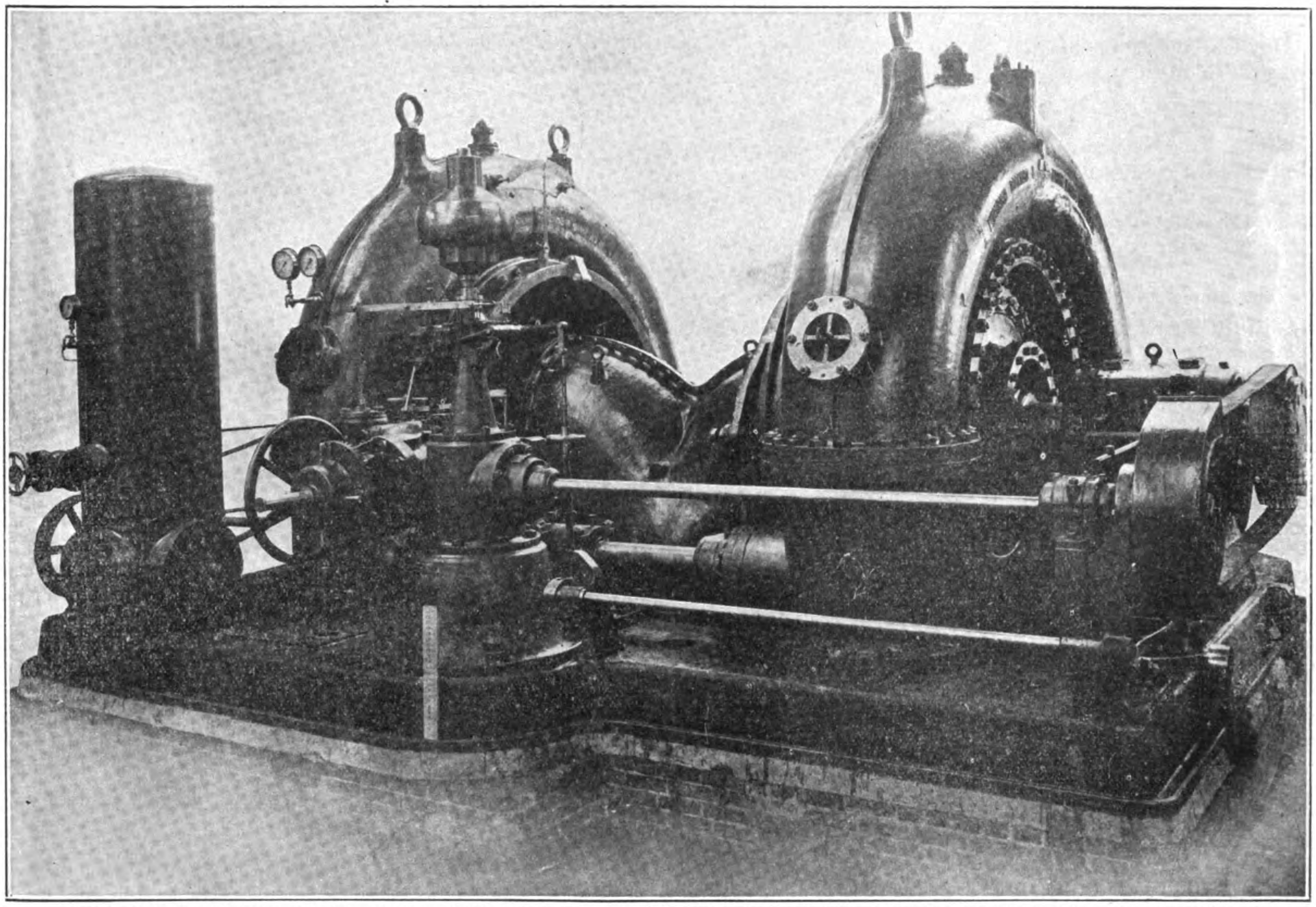
The Daido Denryoku and the Kansai operate very closely with the Tateyama Suiryoku, the Hakusan Denki and the Tenryugawa Suiryoku and as they are all operating in the central part of Japan, despite the fact that they are not included in one organization they are able to work to each other's advantage as if they were. The Ujigawa Denki is the only real competitor of this formidable line of the Daido Denki, and it is in the most advantageous position of all companies in the Kansai, Osaka district to supply power cheaply. It is closely related to the Nihon Denryoku, in which it has invested a greater part of the capital. The Nihon Denryoku is not such an ambitious project as the Daido, but it is closely allied with the Ujigawa, which might well be called its parent company. It is always improving its equipment, machinery, power plants, and transmission system, and it is expected that its new power station on the Takehara River will be completed some time this year. For some time it has been using the transmission lines belonging to the Ujigawa between Osaka and Ozaki, but when its new power plant is completed it will send 5,000 kilowatts of its own power over its own lines now being erected.

The Ujigawa Denki is naturally endeavoring to meet the threatened competition of the Daido Denki, and the relations which it has established with other companies recently have greatly increased its power. But compared to the powerful array of companies swallowed up by the ever-growing Daido last year, the Ujigawa is almost a negligible quantity in the power market, despite the excellence of its management. It generates 74,600 kilowatts to-day, only a little more than that of the Daido group, and when the new plans of the Daido are finally put into operation the Ujigawa's power supplies will be quite eclipsed. Defeated from the outset in the competitive race by number of alliances and power procurable, the Ujigawa Denki is expected to turn its attention to the quality of its service, endeavoring by the excellence of its equipment to meet competition with its more powerful rival. It is reported that the Ujigawa in pursuance of this idea will soon put all its lines underground, and it has already sent many experts abroad to study methods by which the company's equipment and service may be improved.

One of the latest power enterprises to be organized to operate in the central part of Japan is the Nohi Denryoku Kabushiki Kaisha, (Mino-Hida Electric Power Co., Ltd.), established in the spring of 1921. It operates in the provinces of Mino and Hida in Hokuroku district, under the jurisdiction of Gifu prefecture, and it owns many valuable power sites along the rivers in these two provinces. Its authorized capital is Y.3,000,000, and Y.750,000 has already been paid up. A power plant is now being constructed at the village of Neo on the No River, a branch of the Nagara River, 22 miles out of Gifu city. A 7,200-ft. long ditch is being excavated with a fall of 266-ft., which theoretically should generate

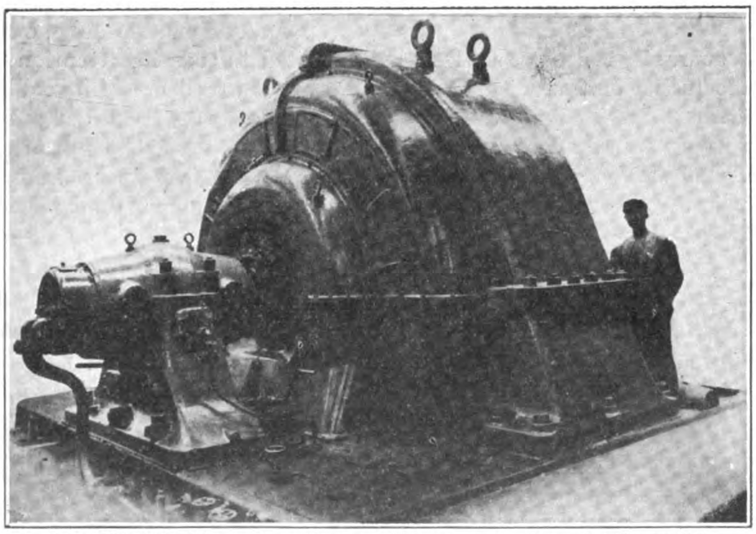
MITSUBISHI ELECTRICAL MACHINERY INSTALLED IN JAPAN

Made by the Mitsubishi Dockyard and Engineering Works at Nagasaki

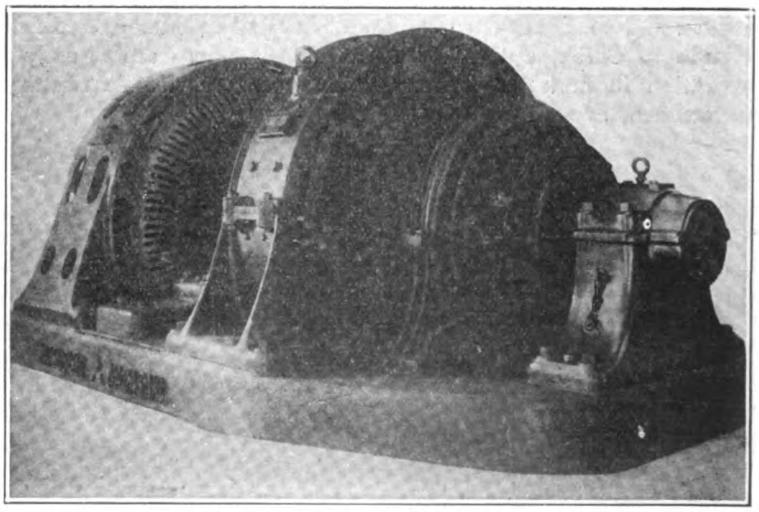


A 10,500 H.P. Francis Water Turbine built at the Kobe Works of the Mitsubishi Zosen Kaisha (Mitsubishi Dockyard & Engineering Works)

4,000 kilowatts. The estimate of construction costs was Y.1,700,-000, which brings the cost per kilowatt generated up to Y.560, estimating net production of power at 3,100 kilowatts. The usual estimate for construction to-day is Y.1,000 per kilowatt, so this is expected to be in a very fortunate position to supply power at very cheap rates, a much needed condition of affairs in the industrial world to-day. The promoters of this company are the directors of the Kansai Denki K.K., and although no power contracts have been entered into between them, it is reported that the Nohi will sell all its supply to the Kansai and its co-operating concerns at a price which guarantees 12 per cent. dividends on the Nohi's capital. The paid-up capital is not sufficient to build the power house planned. But as dividends of 12 per cent. must be paid to attract capital to shares, and debentures can be issued



A 5,700 KVA Alternating Current Generator built at the Nagasaki Works of the Mitsubishi Zosen Kaisha



A 1,000 Kilowatt Motor built at the Nagasaki Works of the Mitsubishi Zosen Kaisha

at 8 per cent., it is likely that the balance of the costs of construction will be covered by an issue of debentures.

Chugoku and Shikoku Districts

In these districts, Chugoku, south of Kobe along the Japan Sea, and the Inland Sea to Shimonoseki, and Shikoku, the island south of Kobe, there are very few rivers with swift currents. There is not one river in the whole district which will develop 100,000 kilowatts. So it is impossible to build large power stations. Demand for power too, is also very scattered, and is not concentrated in any one locality. Consequently the electric power projects are not located around any one city, such as is the case in the Tokyo and Osaka districts. This condition has acted as a deterrant to the amalgamation of existing companies on a very large scale, as it has acted against amalgamations in the Chubu and Hokuroku.

The Okayama Suiryoku Denki K.K. and the Susaki Denki K.K. were recently amalgamated under the name of the Chugoku Suiryoku Denki K.K. The Himeji Suiryoku bought up four small concerns in recent months, and the Hiroshima Dento and the Hiroshime-Kure Denryoku were also amalgamated under the name of the Hiroshima Denki K.K. Several other small companies with capital of less than Y.100,000 have also effected amalgamations of their interests. But all the big changes in company organizations have been centred around the towns, Himeji, Okayama, Hiroshima and Matsue.

In the Chugoku district the lines of water power supply are concentrated around (1) Himeji, drawing power from the Takakawa, the Ibigawa and the Chukusagawa, potentially generating 18,000 kilowatts; (2) Okayama drawing water from the Yoshigawa, Asahigawa and the Koryogawa, potentially capable of generating 30,000 kilowatts and (3) Hiroshima with potential supplies of 58,000 kilowatts developed from the Otagawa, Iwakunegawa and Osegawa.

The Sanin and Sanyo districts located along the Japan sea and near Shimonoseki on the Inland Sea, have very small water power resources. The city of Tottori on the Karogawa, has potential power of 23,000 kilowatts at its disposal, and Matsue can develop 42,000 kilowatts from the Hiigawa, Kanbegawa and the upper stream of the Gonogawa.

Shikoku

There is very little water power to be developed in Shikoku. In Tokushima prefecture there are 73,000 kilowatts to be developed on the upper stream of the Yoshinogawa, and in Kochi prefecture, 45,000 kilowatts can be obtained from the Niyodogawa.

To-day the most important companies operating in Shikoku are (1) Tokushima Suiryoku Denki in Tokushima city, capitalized at Y.6,000,000, developing 1,500 kilowatts from water, and 1,800 kilowatts from coal; (2) Shikoku Suiryoku, in Tadotsu city, capitalized at Y.5,030,000, developing 3,850 kilowatts from water and 1,500 from coal; (3) Iyo Denki Tetsudo (electric railway), capitalized at Y.4,600,000, generating 1,460 kilowatts from water and 1,000 kilowatts from coal; (4) Ehime Suiryoku in Imahara, capitalized at Y.10,000,000, generating 1,980 kilowatts from water power alone; (5) The Kochi prefecture water power electricity business office, in Kochi prefecture, capitalized at Y.1,245,000, developing 2,430 kilowatts from water. The total power generated from water is 12,220 kilowatts, and from coal 4,300 kilowatts.

The Tokushima Suiryoku recently increased its generating plant equipment in Sakura by 2,000 kilowatts, and on the Jinzagawa by 600 kilowatts, and on the Igagawa by 6,000 kilowatts, and its coal power station in Komatsu by 1,000 kilowatts, a total of 9,400 kilowatts in all. At Naruto Straits, the cable station supplied power to the Awaji-Sumoto mills of the Kanegafuchi Cotton Spinning Mills.

Kyushu

Kyushu is one of the centres of the coal mining industry in Japan and the water power resources of that island have not yet been extensively developed.

The more important companies in Kyushu are: (1) Kyushu Suiryoku Denki, in Fukuoka city, generating 59,902 kilowatts from water and 14,865 kilowatts from coal. It has under construction an extension of its water power plant amounting to 15,000 kilowatts; (2) Kyushu Dento Tetsudo (electric light and railway) in Fukuoka city, generating 10,600 kilowatts from water and 30,065 kilowatts from coal; (3) The Kumamoto Denki, in Kumamoto, generating 18,800 kilowatts from water power; (4) The Denki Kogyo Gasu in Kagoshima, generating 1,000 kilowatts from water and 1,760 kilowatts from coal; (5) Nihon Sanso Hiryo (fertilizer company) in Oita generating 29,815 kilowatts from water. All these companies own many valuable power sites not yet developed.

The more important coal mining companies of Kyushu all have their own power plants to use for their own operations, but the Sumitomo, Mitsui and Mitsuibishi interests supply power from their stations to the surrounding districts.

The rivers of Kyushu are capable of developing the following powers :—

Chikugogawa	...	29 sites,	132,442 kilowatts
Oitagawa ...	...	12 „	34,614 „
Onogawa ...	...	10 „	39,789 „
Shiratsuwagawa	...	4 „	48,790 „
Midorigawa ...	...	14 „	61,306 „
Oyodogawa ...	...	22 „	55,595 „
Gokasegawa ...	...	16 „	43,401 „
Sendaigawa ...	...	10 „	3,911 „

The principal distributors are the Kyushi Suiryoku, and the Kyushu Denki Tetsudo, which at the suggestion of the imperial railway department are planning to unite their interests.

The Kyushu Dento Tetsudo, Kyushu Suiryoku Denki, Kyushu Denki Kido, and the Kumamoto Denki are planning a big amalgamation under the name of the Kyushu Soden K.K. (Kyushu General Eelectric Co.) It is planned to develop the potential power of Miyazaki prefecture in south-eastern Kyushu, and to transmit power to the industrial district around Moji. But there are many difficulties in the way of successful operation in Miyazaki prefecture, particularly because the laws of the prefecture permit the authorities to levy a tax on power generated in the prefecture when it is sent to other districts.

Hokkaido

The most important power resources of the Hokkaido are :—

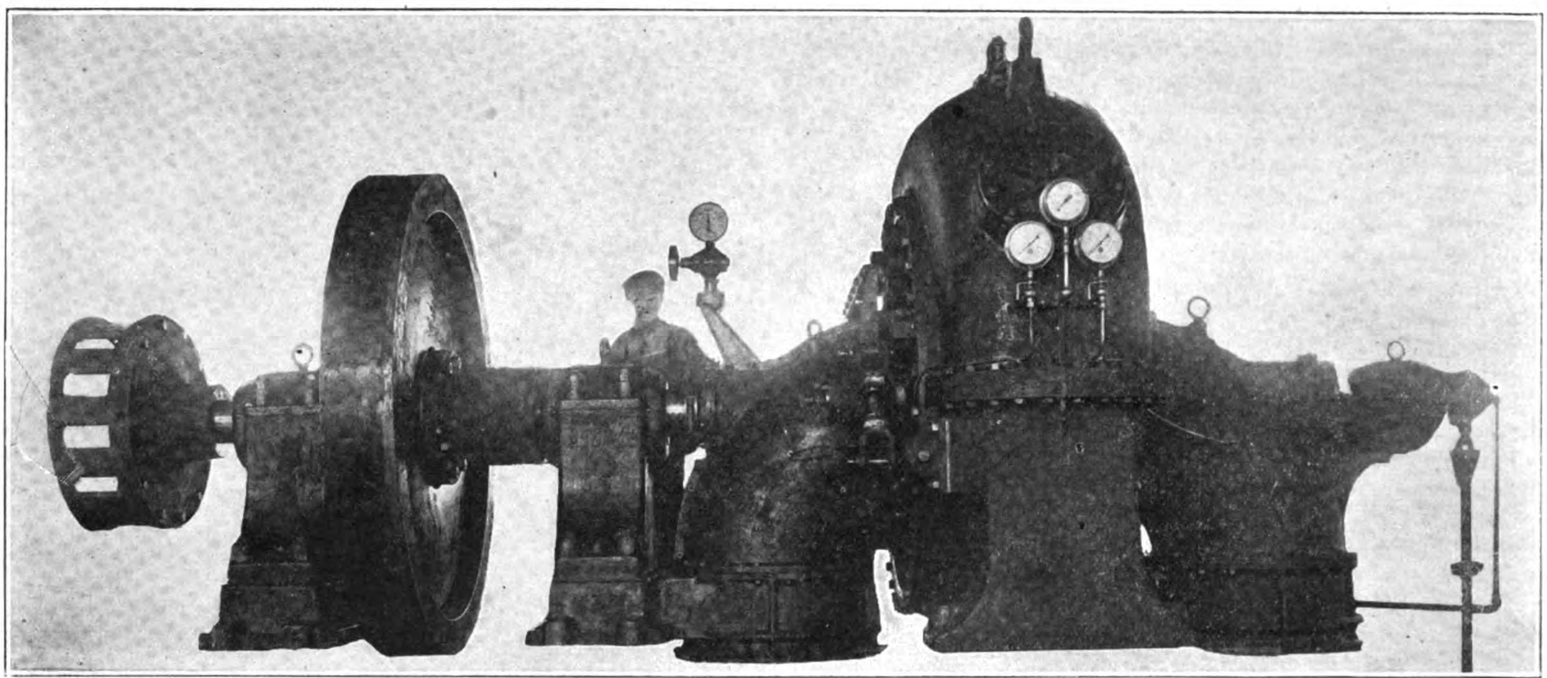
Ishigarigawa ...	... ...	144,000 kilowatts
Shiribeshigawa...	... ...	27,000 „
Togachigawa ...	... ...	96,000 „
Kushirogawa ...	... ...	30,000 „

All these are in the northern part of the island, where there is but little development of population and industry. Even in the south there is little demand for power. In the southern part of the island the Oushi and Nagara rivers have considerable potential power. In the neighborhood of Hakodate the Hakodate Suiden develops power from the Oritogawa, and the Shiribeshi Denki develops power on the Shiribeshigawa, and a branch of the Ishigarigawa. There are many small companies all over the Hokkaido, the Fuji Denki, Sapporo Suiryoku and Oji Seishi, the Nitsui Kozan, etc., but no amalgamation of interests so scattered has been made. Other mines and industrial companies have their own power stations, and the only company making any attempt at concentrating power interests is the Teikoku Dento which finds in the Hokkaido one of the most prosperous districts of its operations.

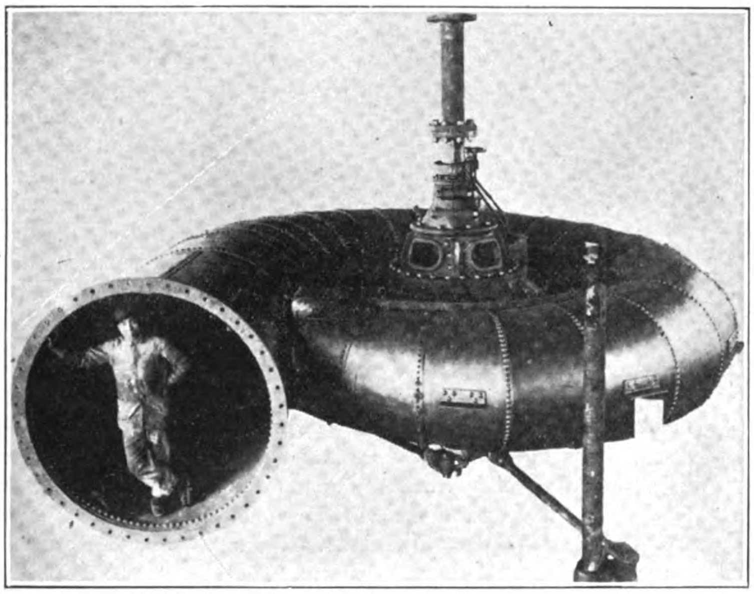
Hydro-Electric Power in Kyushu

During the period of war prosperity there was a great increase in the number of factories established in Kyushu. To furnish the power for many of these factories great strides were made in developing water power resources in that island. At the end of 1914 there were only 101,061 kilowatts developed by hydro-electric, coal and gas plants. According to an investigation of the depart-

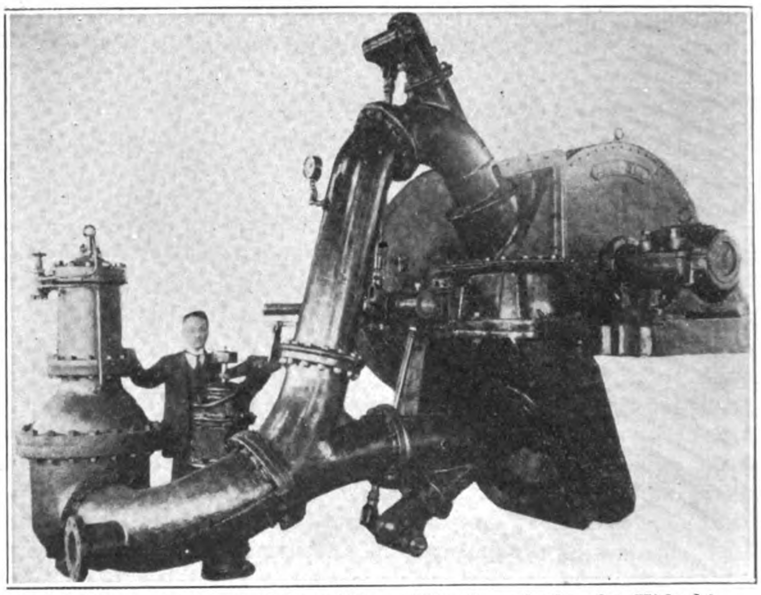
HYDRO-ELECTRICAL EQUIPMENT MANUFACTURED BY THE HIDACHI ENGINEERING WORKS LOCATED AT SUKEGAWA, IBARAKI PREFECTURE, JAPAN



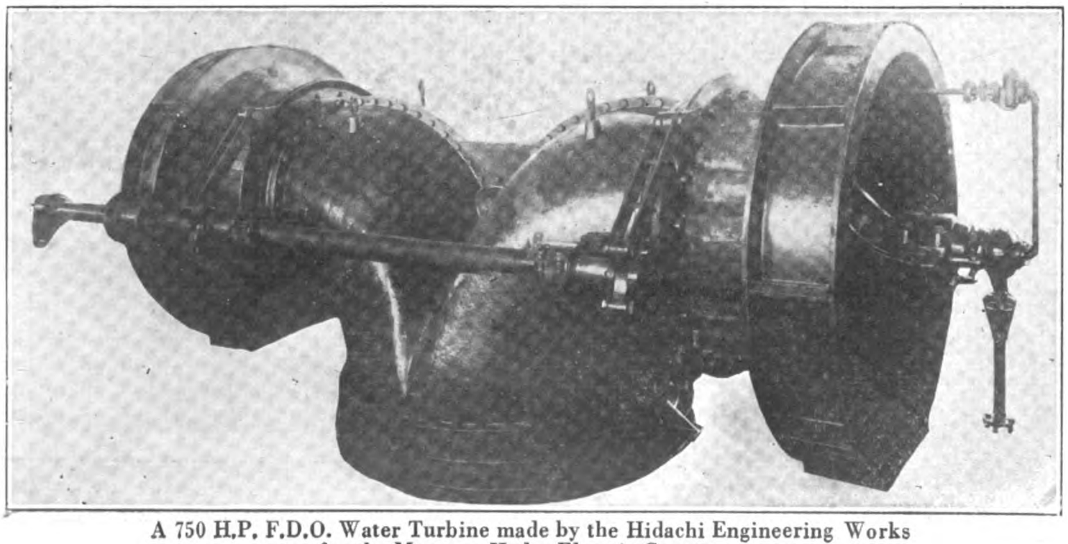
A 2,400 F.D.S. Water Turbine Manufactured by the Hidachi Engineering Works for the Sanyo Hydro-Electric Company



A 1,500 H.P. V.F.S.S. Water Turbine built by the Hidachi Engineering Works for the Shidzuoka Hydro-Electric Company



A 2,400 H.P. Nozzle Pelton Water Wheel made by the Hidachi Engineering Works for the Sanyo Hydro-Electric Company



A 750 H.P. F.D.O. Water Turbine made by the Hidachi Engineering Works for the Mannose Hydro-Electric Company

ment of communications, these three sources of power by April 1920 had developed 465,147 kilowatts. Of this amount 234,584 kilowatts were developed from water power plants, 207,774 kilowatts from coal, and 2,789 kilowatts from gas burning plants.

Between April 1, 1920, and March 31, 1921, a tremenduous increase to O.K. place in the amount of capital invested in electric power plants in Kyushu. On March 31, 1921, the authorized capital of all projects in Kyushu was Y.153,380,000, of which Y.94,250,000 was paid up. This represented an increase af Y.51,590,000 in nominal capital, and of Y.25,980,000 in paid-up capital since April 1, 1920.

One of the conspicuous features of the electric power industry in Kyushu during the period April 1, 1920-March 31, 1921, was the great decrease in the demand for power from the users of large quantities, and the very marked increase, on the contrary, of the number of small users. The almost total suspension of business by many chemical companies and mining concerns so prosperous during the war caused this decrease in demand for large quantities. On March 31, 1920, there were 6,410 electric motors used by 6,612 concerns, consuming 175,000 kilowatts, but at the end of March, 1921, there were 8,538 motors, used by 7,027 concerns, consuming only 109,524 kilowatts. This decrease is entirely due to the closing of many large factories because of the difficulties of continued financing. Even blacksmiths and carpenter shops have entered the ranks of users of small amounts of power, and there is no doubt whatever that this change in the class of users is a healthy sign of the return of peace conditions, and a modernization of the ideas of small machine shop owners.

Four companies control the most important hydro-electric power of Kyushu, the Kyushu Denki Kido Kaisha, Kyushu Dento Tetsudo Kaisha Kyushu Suiryoku Kaisha, and the Kumamoto Denki Kaisha. These four companies also have controlling interests in all the other electric companies of Kyushu.

While the use of electric power by manufacturing concerns has decreased, there has been a steady increase in the use of power for lighting. At the end of March, 1920, one house in Kyushu burned 2.3 lights of 16 c.p. each, from sunset to sunrise. By the end of March, 1921, this had increased to 4.48 lights. The use of electric lights has little appreciable connection with financial conditions, for their use is a development of the blessings of peace. The use of electric power in factories, is, however, in quite a contrary position, being utterly dependent on the financial condition of the country.

The average cost of burning one 16-candle power light from sunset to sunrise for one month in Kyushu is Y.1.057. The meter charge per kilowatt is 20.2 sen. The Osaka Dento Kaisha charges Y.0.555 for the same light, 16 c.p. and the same service. There is a reason for this in the greater cost of equipment in Kyushu, where one pole carries only two or three lights, while the Osaka equipment carries more than 100.

Power contracts are usually individual, so it is very difficult to arrive at the actual cost of electric power in Japan.

There has been a great growth in the amount of power generated by hydro-electric power plants since 1920. But in 1921 power from hydro-electric plants was more expensive than power from coal and gas-burning plants. The price of coal was low in 1921, and it had a very bad effect on the water power companies in Kyushu. If coal remains at its present low price the future development of the hydro-electric power business in Kyushu will be greatly threatened. Not only in Kyushu is the industry threatened, but in other parts of Japan as well. In the Osaka district the price of coal fell to 70 yen per 10,000 *kin* (13,333-lb., 3 6 2/3 tons of 2,000-lb.) If it falls lower than this hydro-electric plants can no longer supply power at cheaper rates than coal burning plants. Just now the price of coal is falling below 70 yen, and the hydro-electric interests are not at all unreasonably concerned about the future of their business. To protect themselves in all emergencies the four Kyushu companies already mentioned are planning to combine their interests.

The background of the Kyushu electric world is composed of Baron Kichiyemon Sumitomo, Mr. Wada Toyoji, and Mr. Momosuke Fukazawa. These three men are planning the organization of the Kyushu Soden Kaisha (The Kyushu General Electric Co., Ltd.), with a capital of Y.30,000,000, which they will later increase to Y.200,000,000. It plans to exploit the unworked resources of Miyazaki prefecture in the south-east of Kyushu.

Miyazaki prefecture possesses most of the undeveloped water power resources of Kyushu. Many proposals have been made from time to time to utilize these resources, but the inhabitants have always violently opposed any exploitation of the prefecture's power unless it is used entirely within the prefecture. This is nonsense, but the people complain that if the power is monopolized by a company like the Kyushu Soden Kaisha, they will be charged anything the company pleases for the power they will use. But actually the Kyushu Soden would serve to smooth out the inequalities in the present service. Power could be switched from one locality to another as plants are laid off because of low water supply, and when necessary power could be turned on from coal-burning plants. The cost of new lines would be greatly economized, and it is now reported that despite the protests of the people of the prefecture, the company will be organized, and that it will eventually exploit the resources of Miyazaki prefecture's streams.

It has been estimated that it will cost Y 550 to develop one kilowatt in Miyazaki prefecture. It is 180 miles from Miyazaki to north Kyushu where most of the power will be used. To send power 180 miles is rather an expensive proceeding, so that altogether the cost of power from Miyazaki prefecture will not be very cheap. The capital of Y.30,000,000 planned for the new General Electric Company of Kyushu, is not sufficient to meet all the demands the construction will make on it, so it will probably be necessary to increase this capital to Y.200,000,000 before actual work is commenced.

The Kyushu Electric Light and Railway Company, which supplies Nagasaki with electric light and power will shortly enter into a contract of amalgamation with the Kansai Electric Company of Nagoya. The capital of the Kyushu company is Y.50,000,000 of which Y.24,312,500 is paid-up. The Kansai company is capitalized at Y.73,389,000, of which Y.52,783,441 is paid-up. The capital of the new company which is to absorb these two companies will be Y.121,989,600.

The Kyushu company obtains most of its power from coal plants, and the Kansai from water power. The Kyushu company needs funds to build hydro-electric stations in Miyazaki prefecture, and an electric tramline between Omuta and Fukuoka, which will require Y.20,000,000 at least. The Kansai company wishes to obtain the services of the Kyushu company's directorate, and as the two companies are capitalized by the same individuals the amalgamation was more or less a matter of course.

The Teikoku Dento Kabushiki Kaisha

(The Imperial Electric Light Co., Ltd.)

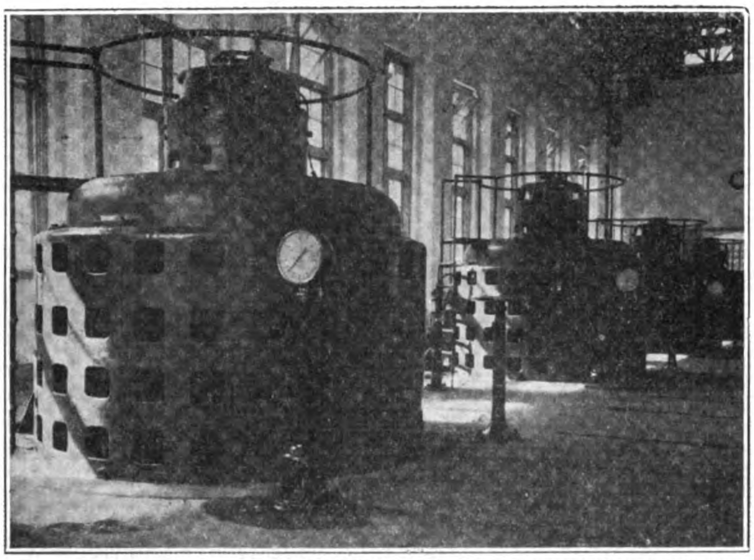
A Typical Example of Electric Lighting Expansion

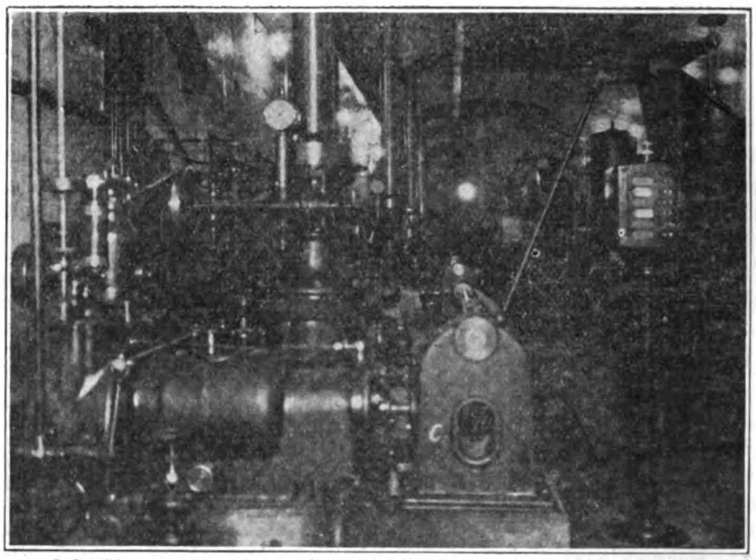
One of the most important movements in Japanese industry and finance is the absorption of small water power companies by larger concerns, affecting a concentration of power facilities in the important industrial districts.

The Teikoku Dento K.K., however, is the only concern of its kind specializing in concentrating electric light companies under its control. It is ten years since it was first organized with the object of investing in sound electric light projects in country districts. During the years of its operations its methods of business have undergone constant change, and its policy of expansion in all profitable directions has eventuated in a scheme of concentration of lighting facilities through amalgamation with small companies operating in and about its special territories.

In its beginnings there were no particularly well defined plans formulated for concentration, but as the demand for electric light continually expanded well defined lines along which a concentration

SWISS TURBINES IN JAPAN FROM THE WORKS OF ESCHER, WYSS & COMPANY





4-9,600 H.P. Turbines installed in the Power House of the Katsuragawa Hydro-Electric Company

of operating interests could profitably be undertaken were developed. The Teikoku Dento was a pioneer, if not the only enterprise, in the field of electric light expansion in the less densely populated districts. The company operates from three centres, controlling, or owning outright, groups of companies supplying the geographical districts covered from these centres: (1) Vicinity of Tokyo, country districts (The Kwanto); (2) Tantan District, north of Kyoto; (3) Hokkaido.

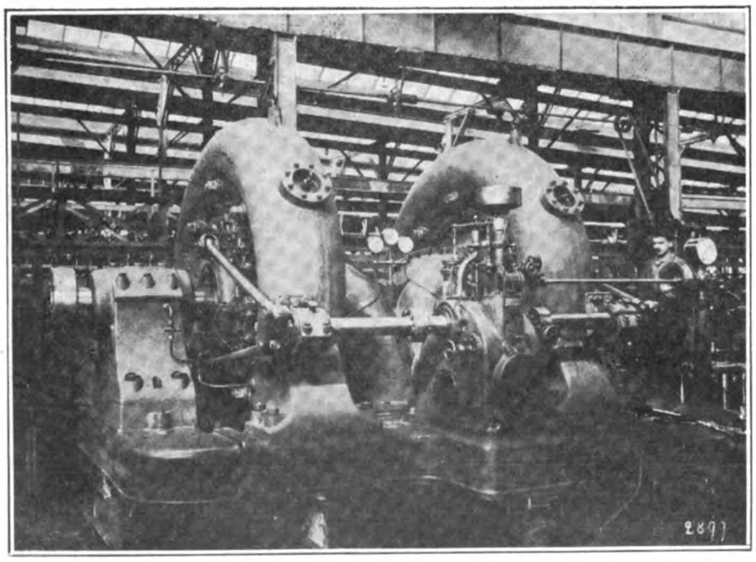
The greatest strength of the company is concentrated around Tokyo, where it has recently been strengthened by absorbing the Shimotsuke Denryoku Kabushiki Kaisha (Shimotsuke Electric Power Co., Ltd.), referred to in detail further on. Following this amalgamation, the Teikoku Dento completely reorganized its business and as a consequence it has now become a new and forceful factor in the electric power field in the Kwanto district (eastern Japan with Tokyo as the centre).

On October 1, 1921, the Teikoku Dento annexed the Santan Denki Kaisha capitalized at Y.5,000,000 and doing business at Toyooka Machi, in Hyogo prefecture. The Santan paid a dividend of 10 per cent. in September 1921, but owing to lack of capital it was found difficult to develop its business to keep in touch with the growth of the district in which it operates. The Teikoku at once took advantage of this opportunity to get into the Osaka-Kobe territory.

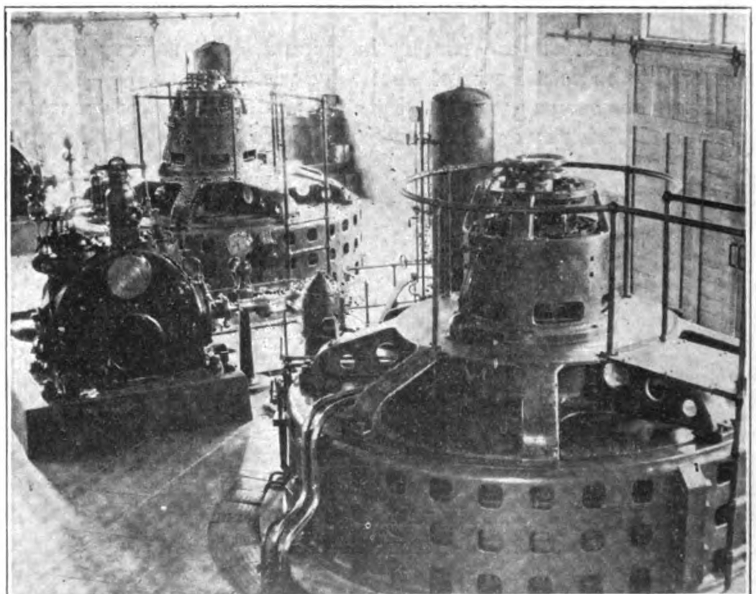
The development of the Teikoku Dento has steadily followed along the line of amalgamation with small lighting companies, especially in the second half of 1917, and even after the panic of 1920 no adverse effects are seen in the company's reports, as indicated in the following table:—

Half Year		Paid-up Capital Yen	Net Profits Yen	Dividends Yen	Rate of Dividend Per cent.
1915, 1st	..	880,000	45,111	35,200	8
2nd	..	1,000,000	53,589	42,000	8½
1916, 1st	..	1,000,000	64,656	50,000	10
2nd	..	1,000,000	77,402	55,000	10
1917, 1st	..	1,000,000	84,967	60,000	12
2nd	..	1,704,000	137,749	102,270	12
1918, 1st	..	1,775,000	151,410	106,500	12
2nd	..	2,830,000	314,922	169,800	12
1919, 1st	..	2,830,000	350,308	169,800	12
2nd	..	2,830,000	372,351	169,800	12
1920, 1st	..	5,175,400	567,880	310,525	12
2nd	..	6,489,200	724,951	389,525	12

Unfortunately, when the old company was dissolved early in 1921, no report was issued, and it has been impossible to include the first term of business in 1921 in this table. On March 1, 1922, this company called up the outstanding Y.1,840,000 unpaid capital,

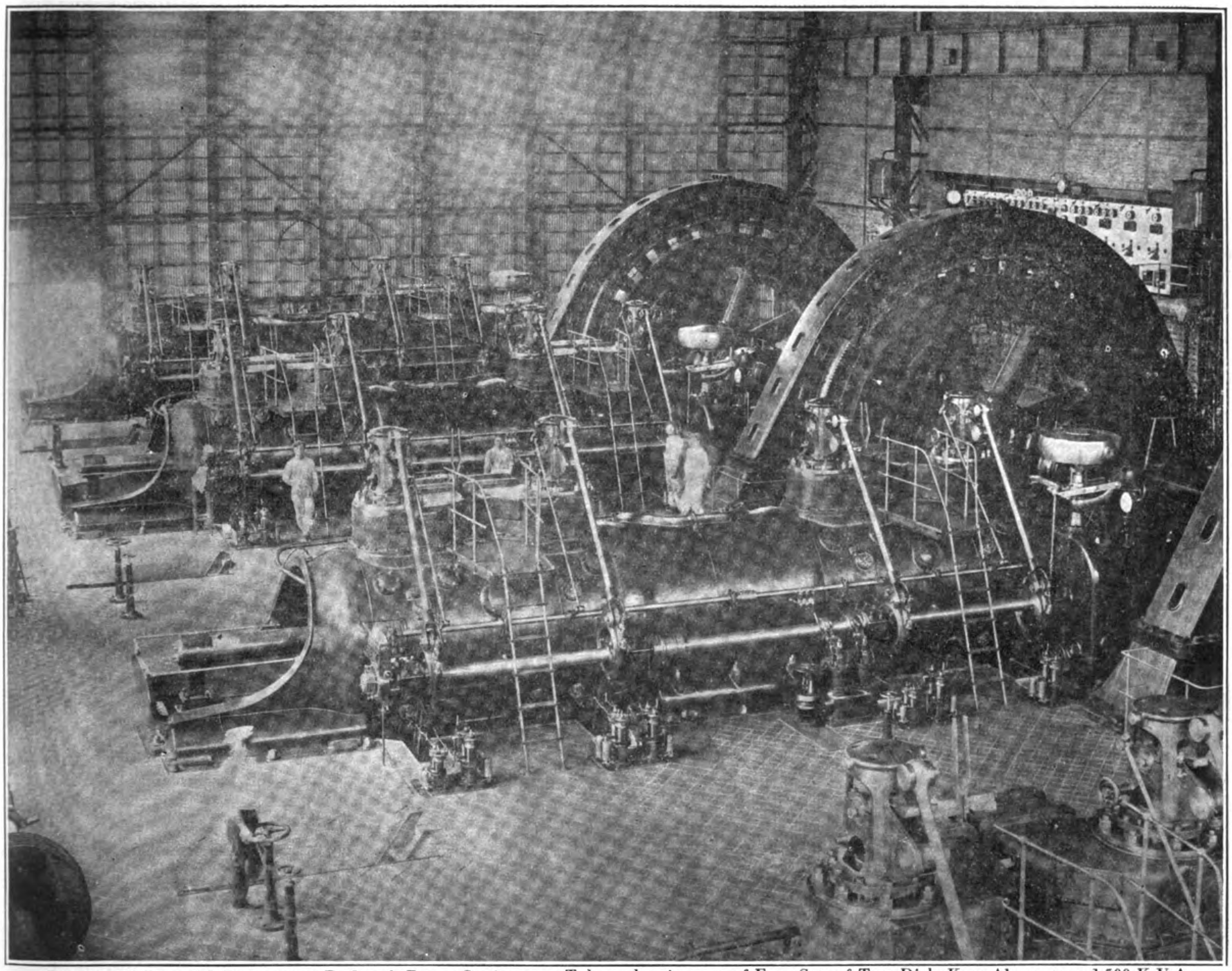


Six 12,500 H.P. Escher, Wyss Turbines installed in the Power House of the Tokyo Dento Company

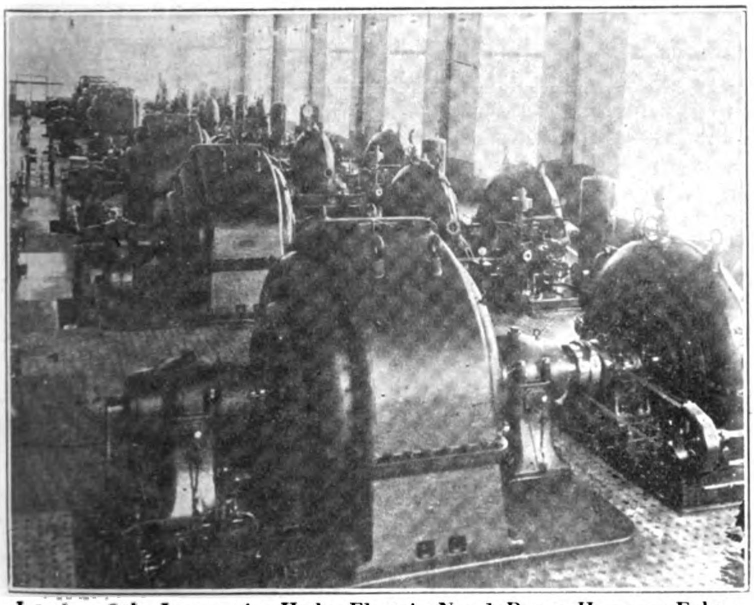


Two 2,750 H.P. Escher, Wyss Turbines operating in the Kyoto Dento Power Station

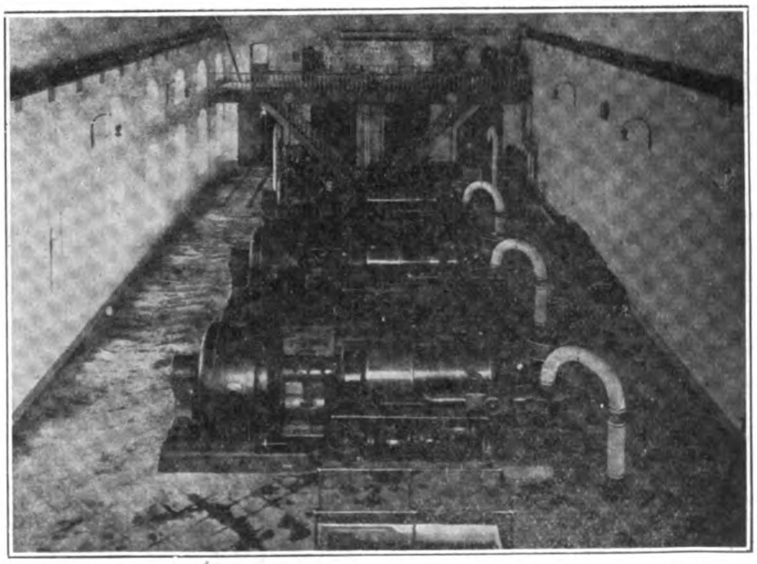
ENGLISH ELECTRIC COMPANY (DICK KERR) INSTALLATION IN JAPAN



Interior of Imperial Government Railway's Power Station near Tokyo, showing one of Four Sets of Two Dick Kerr Alternators, 1,500 K.V.A. each, 3 phase, 25 cycles, 11,000 volts, 94 rpm, driven by Lilleshall Gas Engines

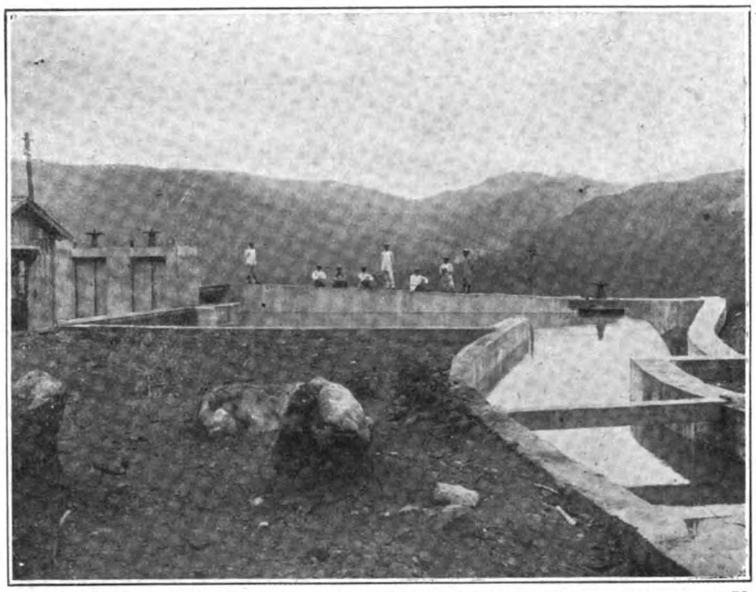


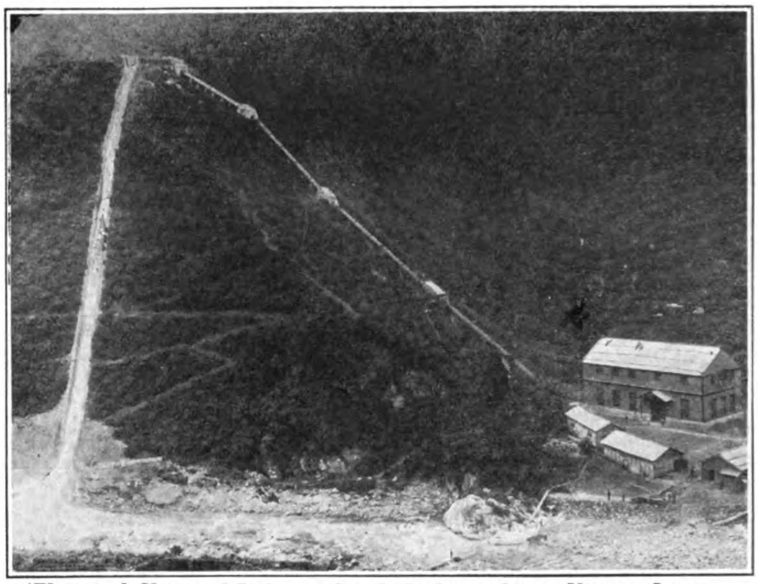
Interior of the Inawashiro Hydro-Electric No. 1 Power House at Fukushima-ken, showing 6 Dick Kerr Alternators of 7,775 K.V.A. each, 3 phase, 30 cycles, 6,600 volts, 375 rmp, driven by Escher, Wyss Turbines



Interior of the Keihan Electric Railway Power Station at Osaka, showing 3 Dick Kerr Alternators, each 850 K.V.A., 3 phase, 25 cycles, 2,300 volts, 1,500 rmp.

A MODEL WESTINGHOUSE INSTALLATION IN JAPAN





The Intake and Power House of the Denki Kagaku Kogyo Kabushiki Kaisha (Electrical Chemical Industry Co., Ltd.) located near Niigata, Japan

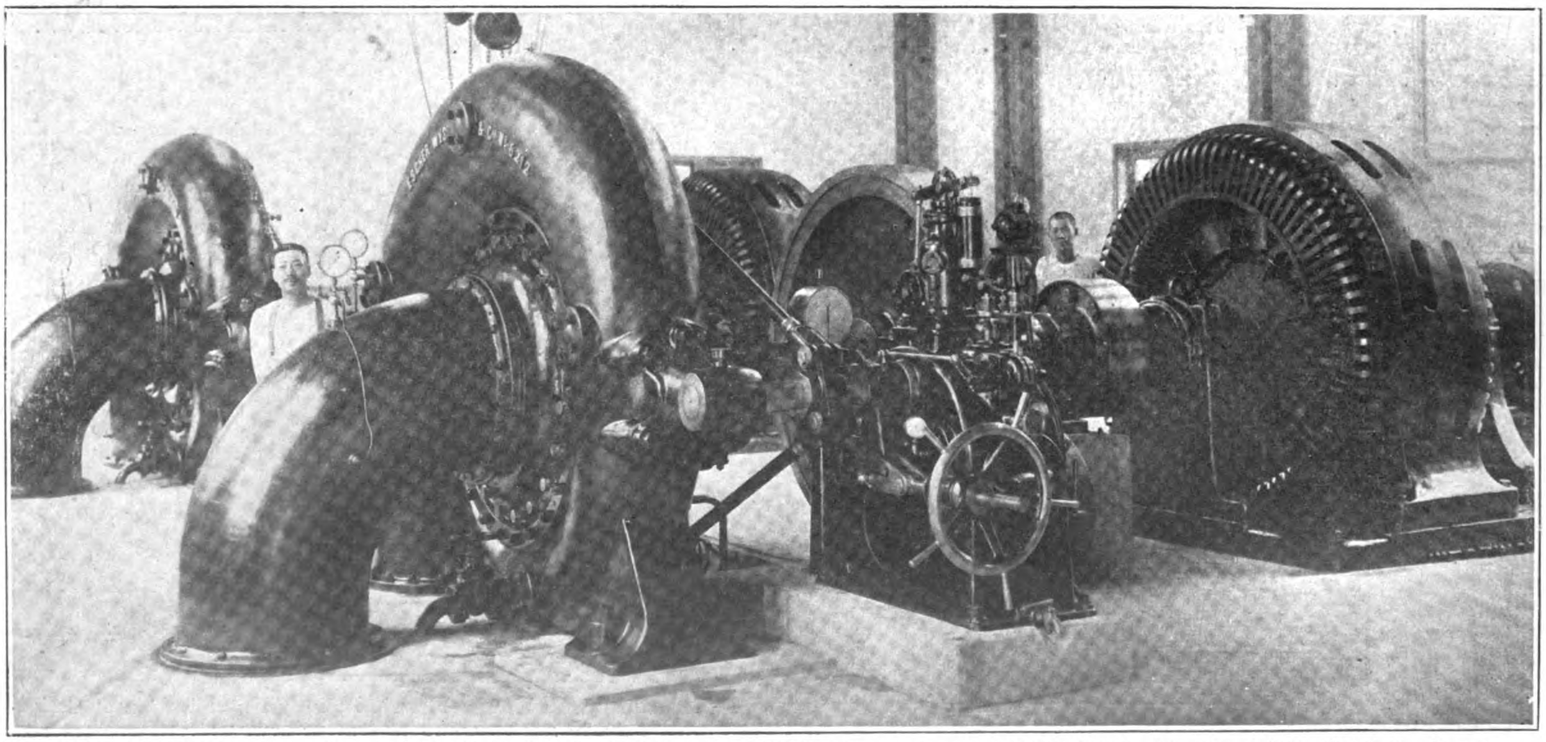
which brings the total up to its authorized amount of Y.24,645,000, fully paid-up.

Recently the department of communications licensed the amalgamation of the Teikoku Dento with the Saitama Dento K.K. and the Santan Denki K.K., and in order to purchase these concerns the company's capital was increased to Y.33,252,000. These two amalgamations extend its influence further afield.

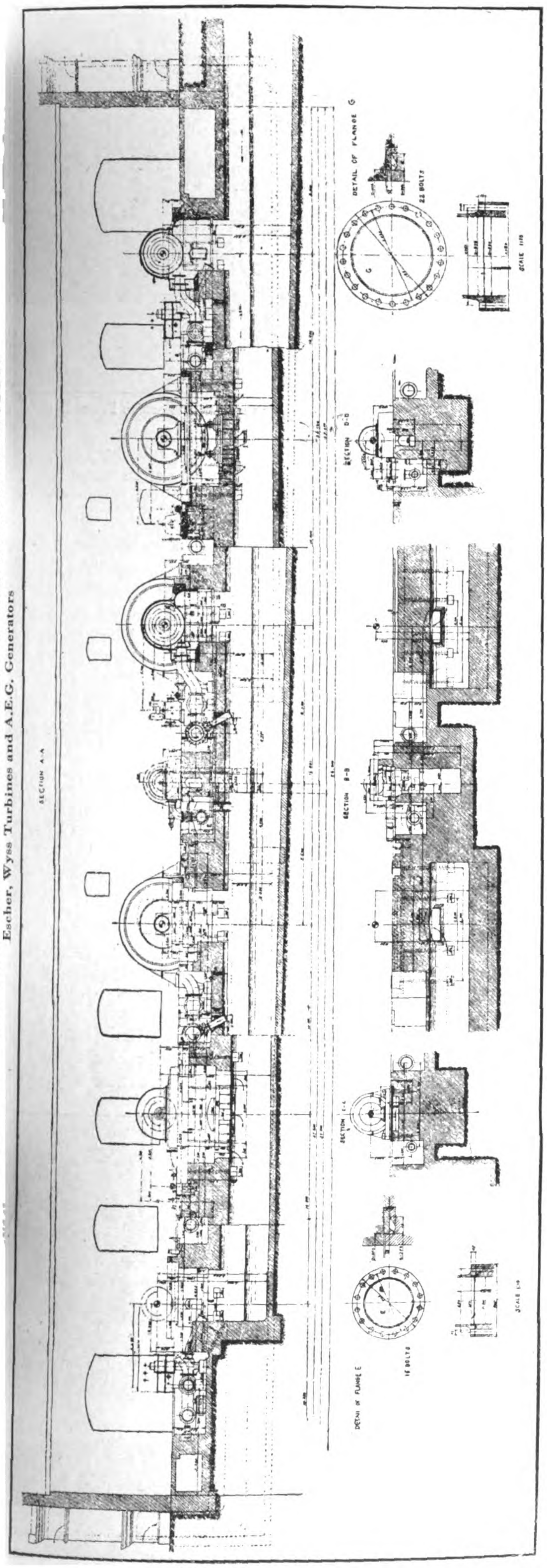
From 1921, the business of this company enjoyed a remarkable expansion. During the year the number of lights supplied increased 250,000, and it is now planned to increase the service to supply 1,000,000 lights in all. In order to carry out this plan it is necessary to build a new power plant on the Kinugawa which will develop 2,100 kilowatts, and another 2,000 kilowatts, steam generating plant will be built at Miatsu in Tango province.

Plans are also afoot to effect an amalgamation with the Yuragawa Suiryoku Denki K.K., generating 2,000 kilowatts. If this is carried out the capital of the Teikoku Dento must be increased to Y.50,000,000. This increase was authorized at the last general meeting of the shareholders of the company, and it was decided to issue Y.16,000,000 of new shares at the end of May, 1922, to be allotted to old shareholders on the basis of one new one to two old shares. The issue will in all probability not be floated easily as it is now difficult to sell stocks unless 12 per cent. dividends are visible.

It is also part of the plan of the Teikoku Dento, to annex the Musashi Suiden, capitalized at Y.6,400,000, of which Y.4,600,000 is paid up. It has a water power station at Kawagoe in Saitama prefecture generating 4,000 kilowatts, and an 800-kilowatt steam generating plant. Another station is now being constructed to produce 2,000 kilowatts. The Musashi Suiden supplies 120,000 lights and sells power amounting to about 3,000 h.p. The generating stations are only about eight miles from Omiya, north of Tokyo, and between the two towns the company operates an electric railway, which the Teikoku Dento will not take over.

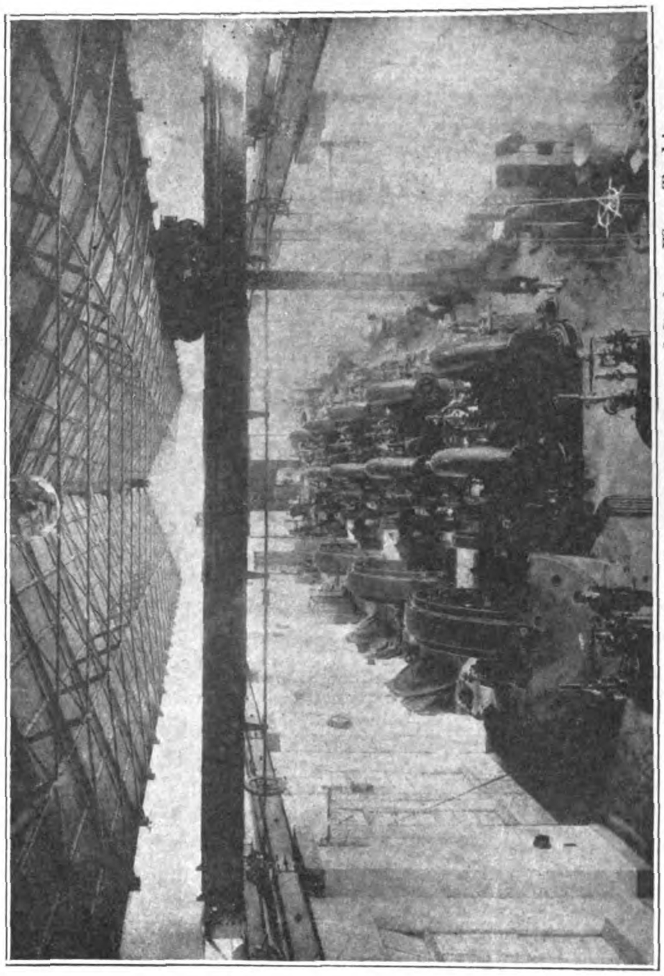


Interior View of the Power House of the Electric Chemical Company at Niigata, showing two 2,500 K.V.A., 50 cycles, 3,300 volt Westinghouse Generators, driven by Escher, Wyss Turbines

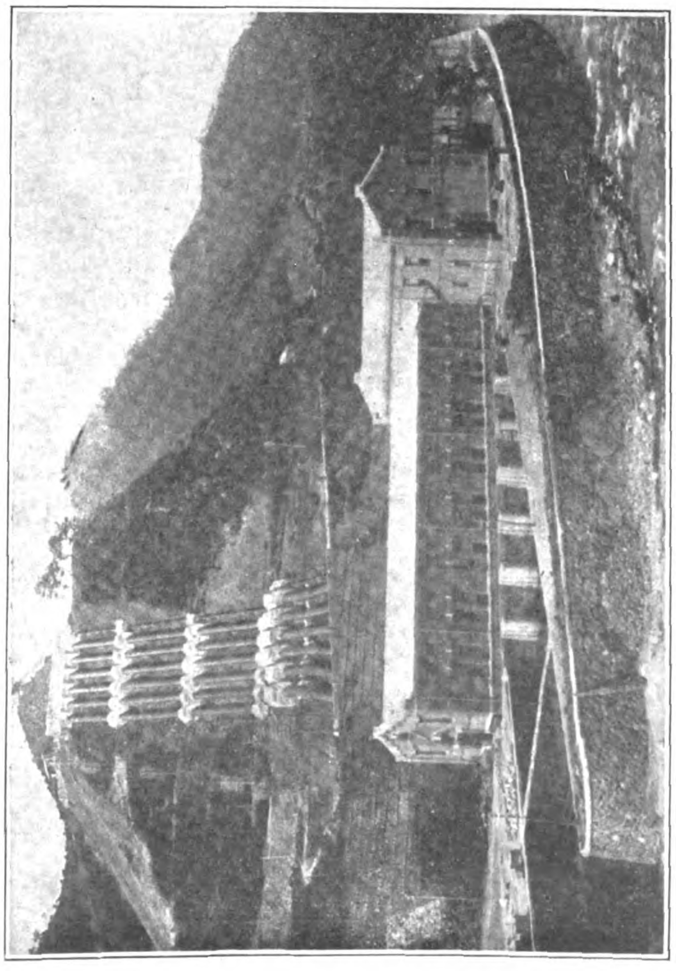


PLAN OF THE KATSURAGAWA HYDRO-ELECTRIC POWER STATION
Escher, Wyss Turbines and A.E.G. Generators

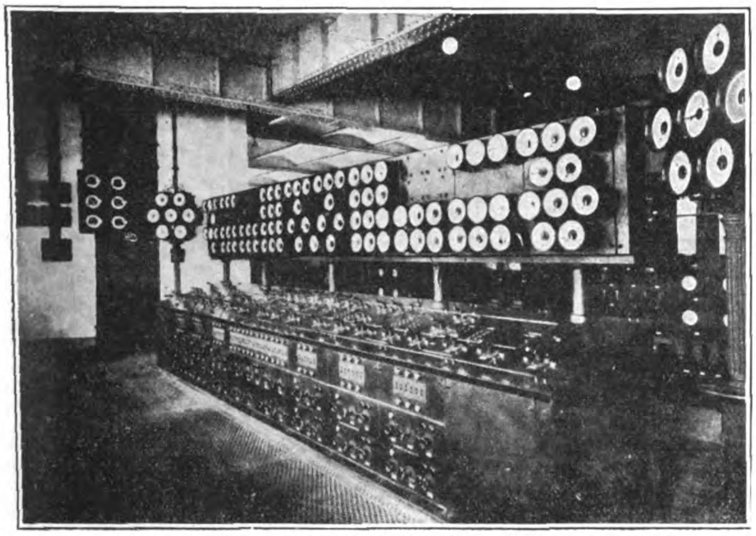
THE KOMA POWER STATION OF THE TOKYO ELECTRIC COMPANY



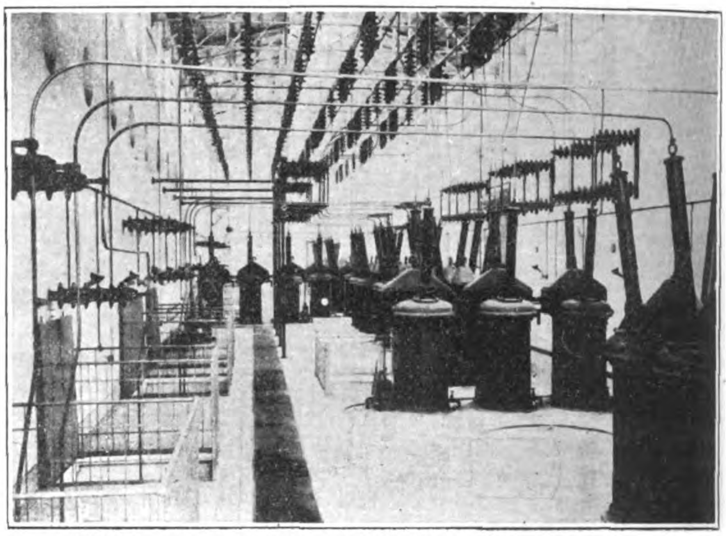
Interior View: Siemens Schuchardt Generators and Escher, Wyss Turbines



The Power House



Main Control Board at the Inawashiro Power House



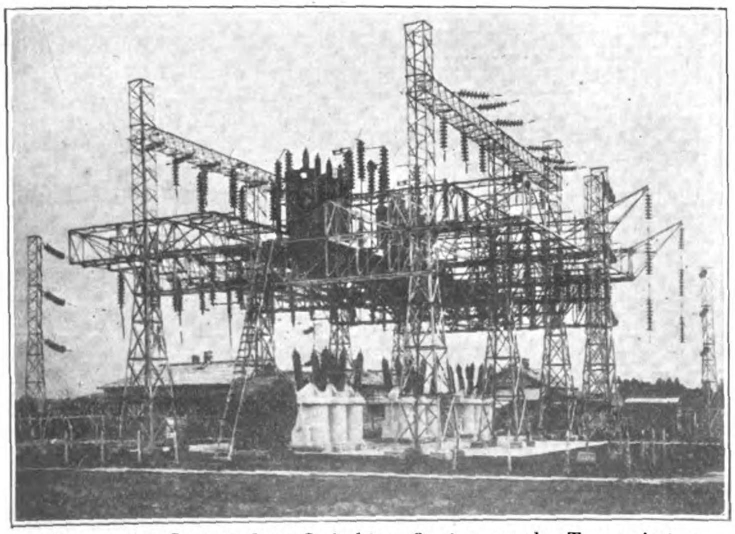
High-tension Switch Room at the Inawashiro Power House

Profits of the Teikoku Dento at the end of March, 1922, are estimated at Y.1,550,000, and a dividend of 10 per cent., 1 per cent. more than at the end of September, 1921, will probably be paid.

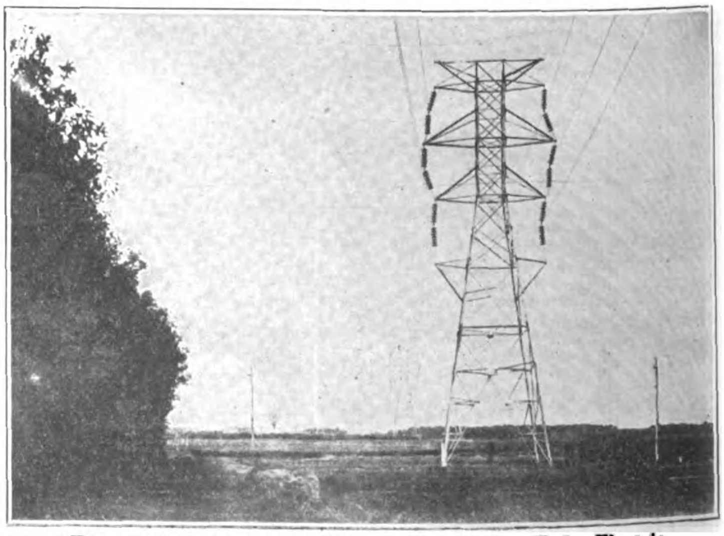
In 1917, control of lighting companies in Chiba practically passed into the hands of the Teikoku Dento. Early in 1918, a new field of operations was entered when the Otaru Denki K.K. and the Hokkaido Denki K.K. were bought out, and operated under the name of the Hokkaido Branch of the Teikoku Dento. By the beginning of 1920, this company had under its direct control 22 electric light companies. It also owned the Teikoku Seiyu K.K. (Imperial Oil Mfg. Co., Ltd.) The greatest advance in the history of the company, however, was made in 1921 when the old company with all its subsidiaries was dissolved on March 31, and reorganized on April 1, 1921, as the new Teikoku Dento K.K. The reorganized company included the Sotobo Dento K.K., the Toyokuni Dento K.K., and on April 16, the Shimotsuke Denryoku K.K. was annexed. This series of important amalgamations at once placed the Teikoku Dento in the front rank of Japanese electric light companies. The company's success has been conspicuous in some districts while in others its failure has been pronounced. However, the fact that expansion has been regular is shown in the foregoing table. Comparing business for the second half of 1921 with that of the first half of 1914, the number of lights increased 20.6 times.

Originally, most of the company's power was purchased from other power supply concerns. What little power it produced itself was generated by gas engines. However, since the annexation of the Shimotsuke Denryoku many changes have been made in contracts for power. Their gas engine generators have been abandoned at most stations. Several of the earlier subsidiary companies, the Katsuura Dento, for instance, generate from water power. The Miura station, south of Yokohama had been using a gas engine to generate power, but since its amalgamation with the Teikoku Dento it bought power from the Yokohama Denki, now the Tokyo Dento. The Seibu station receives power from the Tokyo Dento, and the Sakura and Hishigawa offices from the Tonegawa Hatsuden Sho, now also Tokyo Dento. In the west, the centre north of Kyoto, the Tajima station generates 500, kilowatts from water power, a part of which is supplied to the Fukuchiyama station. The Oyeyama station has its own hydro-electric generator. In the Hokkaido 1,500 kilowatts are purchased from the Oji Paper Company, and 300 kilowatts from the Shiribeshi Denki. The company owns a generating plant of its own at the Iwauchi Suiryoku K.K.

The district north of Kyoto is practically self-supplying. The Hokkaido district gets its principal supply from others. But the Tokyo district lacked water power, especially in Chiba. There is no main line for power transmission in Chiba which can be used between station and station, and for this reason even after amalgamations which have akready been made there, the financial savings from the combinations have been very small. Gas power is uneconomical and small companies are able to supply their own needs by using gas engines at no greater cost than purchasing power from the Teikoku Dento. This was soon found out, and gas engine supply was slowly replaced with water power purchased from other concerns. But water power companies in Chiba have no surplus of current and there is a great scarcity of power urgently needed by the Teikoku Dento in that field. It became necessary therefore to



Utsunomiya Intermediate Switching Station on the Transmission Lines of the Inawashiro Hydro-Electric Company



Type "A" Transmission Towers, Inawashiro Hydro-Electric Company's Lines

develop its own water power. To do this would have cost at least Y.1,000 per kilowatt generated, making the cost of light and power too high for practical uses.

Accordingly, the company set out to effect combinations of interests with water power companies in Chiba, and in this way hoped to obtain control of the much needed supply. If this could be effected transmission lines could be built all over Chiba, and all the company's stations connected up by a main line. It was in pursuance of this intention that the Shimotsuke Denryoku was annexed, and there is now enough power available for the company's own use. This combination really opened a new era of expansion for the Teikoku Dento. The Shimotsuke Denryoku Company is a most important acquisition for the Teikoku Dento. Its capital paid up in full before the annexation was Y.3,700,000 and its territory extended from Utsunomiya to Nikko, Imaichi, and Shikanuma in Tochigi prefecture: through Noda, Sawara, Tagane, in Ibaraki prefecture, and all over Chiba prefecture, serving more than 70 towns and villages. It owned important hydro-electric generating stations at Nikko, and Ishinada, and was constructing a new power station on the Kinugawa. It also owned important power rights on the Nakagawa. Its high-pressure transmission lines extended beyond its own boundaries, because it bought power from outsiders which it distributed in its own district.

The Teikoku Dento in its Tokyo field, at least, was distinctly not a self-sufficing concern, so far as power was concerned, depending largely on the Tokyo Dento for current. But the Tokyo Dento recently entered upon a period of extremely active expansion of its boundaries, and by purchase, co-operation and investment has so greatly increased its power rights during the past two years that the Teikoku Dento began to fear for its continued independent existence, foreseeing that unless something very radical were not done to secure its position it would probably be driven out of the Tokyo field by lack of water power. Naturally, the annexation of the Shimotsuke Denryoku was a most opportune piece of business for the Teikoku Dento.

In 1912, the Shimotsuke Denryoku supplied 15,923 lights, and 594½ h.p. In 1921, before the combination was effected, it supplied 119,480 lights and 3,091½ h.p. It supplies 43,917 houses in Tochigi, Chiba and Ibaraki prefectures with light. The Teikoku Dento not only got much needed water power from this amalgamation but expanded its boundaries for light and power supply.

Before the annexation, the Teikoku Dento and the Shimotsuke Denryoku were paying dividends of 12 per cent. a year. The amalgamation was expected to permit a higher rate of dividend to be paid, but the terms of the amalgamation, placing the shares issued to the old shareholders of the Shimotsuke on a 10 per cent. basis, and the expenses of continuing the expansion deemed necessary to the company's continued existence as an independent concern, decreased the profit rate last year, and the common shareholders received only 9 per cent. in September, 1921.

The first business term of the new company will be completed on March 31, 1922. The number of lights operated was announced to be 590,729, ten c.p. in December. Power sold amounted to 7,902 h.p. This is a satisfactory situation, and business is known to be gradually expanding.

The head office of the Teikoku Dento K.K. is in Tokyo, with eight branch offices in Chiba prefecture, four in Ibaraki prefecture, two in Saitama prefecture, one in Tokyo prefecture and one in Kanagawa prefecture. There are 17 offices in the Tokyo district.

Westinghouse Radio Broadcasting Service

ON account of the great success and wide-spread interest that has been the outcome of pioneering in radio telephone broadcasting by the Westinghouse Electric & Manufacturing Company, the company has announced a complete plan of covering the entire United States with a service to the home that will allow anyone, anywhere in the country to enjoy the many benefits of radio. The operation of the first radio broadcasting station of its kind in the country at East Pittsburgh, Pennsylvania, for the past twelve months, has opened possibilities hitherto undreamed. From this station alone persons in Canada, New England, Florida, Arizona, the Dakotas, and at greater distances, have been able to enjoy the service. Even in Cuba, Mexico and on ships in the middle Atlantic and on the Gulf of Mexico many have heard the concerts broadcasted from East Pittsburgh.

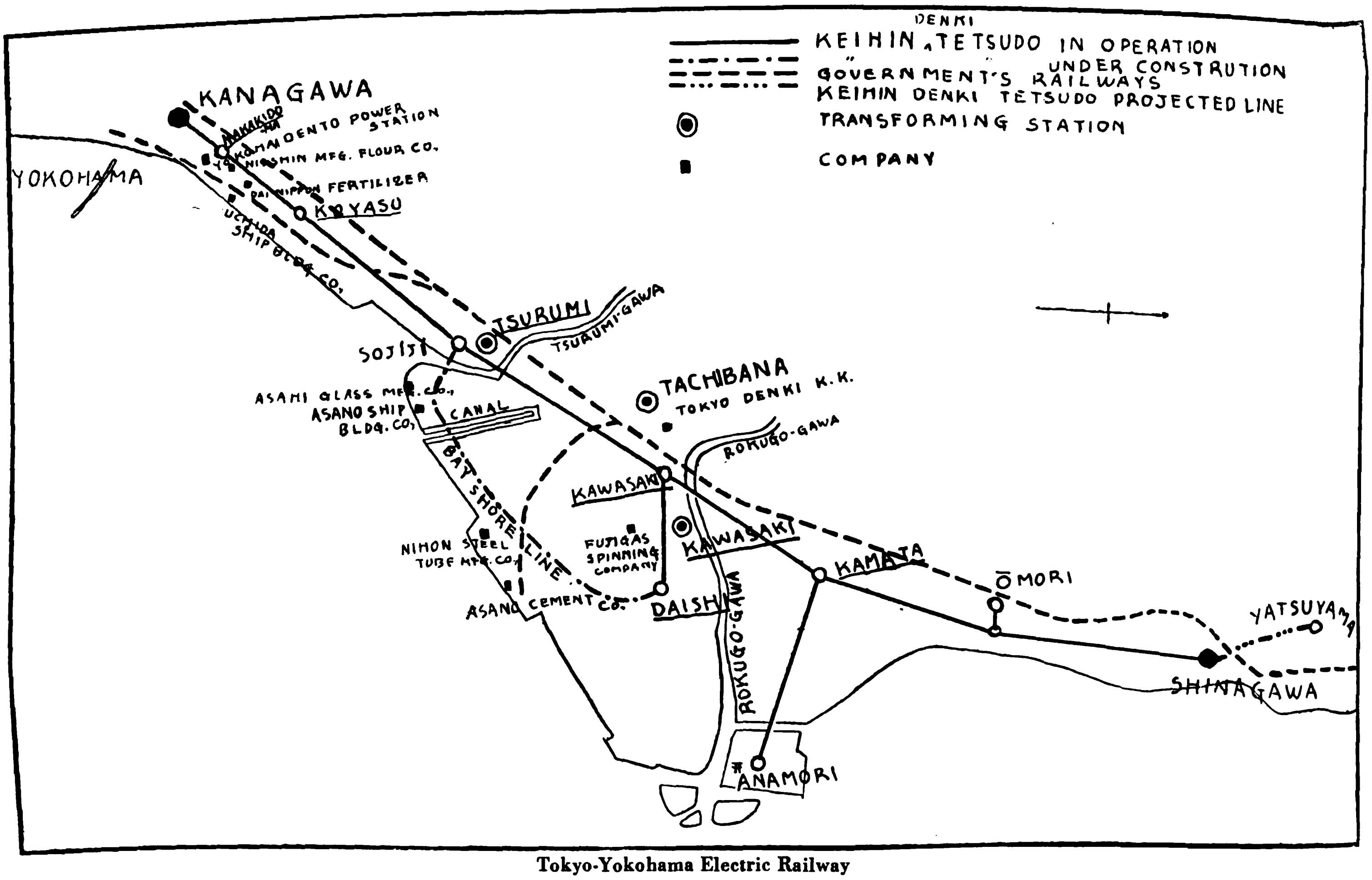
In order to cover certain parts of the country not reached by this station, and to intensively service other parts, the Westinghouse Company has laid out a complete program, and has already added three large stations. At Springfield, Mass., station WBZ supplies New England; at Newark, N. J., station WJZ takes care of the Middle Atlantic and Southern States; and at Chicago, Ill., station KYW services the Middle and Western States.

The fact that the pioneer work of Westinghouse has not been in vain is shown by the fact that although operating a full year, station KDKA at East Pittsburgh continues to interest more people as time progresses. This is due, however, not so much to the novelty of radio telephone broadcasting, but to the well-planned and diversified program that has been established. The service started with the transmission of presidential election returns in November, 1920, and has progressed through the broadcasting of phonograph music, entire church services, speeches of prominent men, acts from theatres, musical recitals, reports of boxing contests, results of baseball, football and basket ball games, complete minstrel shows, government market reports, New York stock market reviews, national and international news from the station at East Pittsburgh. At Springfield, Mass., in addition to many of these features, there is a periodical talk to farmers about market and stock conditions. A feature of the Newark, N.J., broadcasting station has been bedtime stories for the children, marine information, and talks on radio. The complete transmission of grand opera from the Chicago Opera Company productions has been the feature of the recently established station on the Commonwealth-Edison building in Chicago. It is predicted that as a result of the diversified entertainment and information which have been broadcasted through these stations during the past year this service will prove of expanding value and distinctive interest to mankind. In all probability radio will be as popular in the home as the phonograph is to-day, and will be of as great interest to the public as the moving picture show.

The programs as conducted by Westinghouse usually last for an hour each evening, and they are announced far enough in advance to enable everyone interested to know what is contemplated. Such stars as Geraldine Farrar, Rachmaninoff, Telmanyi, Clarence Whitehill, Mary Garden, Muratore, Edith Mason and Rasia have performed for the radio, and the programs are put on a very high plane. Many speakers of note have talked over the radio, some of them being Secretary of Commerce Herbert Hoover, Assistant Secretary of the Navy Theodore Roosevelt, Secretary of War Weeks and Secretary of Labor Davis.

In order to perfect the transmission of music by radio Westinghouse engineers have made considerable research studies of the different frequencies of music. A studio has been built especially for the singing of artists so that the reproduction will be accurate. The studio at East Pittsburgh consists of a room 20-ft. by 30-ft. completely lined with burlap and cloth and without windows so that there will be no reflection of sound. These reports are checked later with the reception qualities at a receiving outfit. A considerable amount of data already obtained indicates the proper methods of transmitting various types of music.

This work is simply a sample of the many things being done to perfect the service and make radio broadcasting a real benefit to the public.



Tokyo-Yokohama Electric Railway

Japanese Electric Railways Expanding

The Tokyo-Yokohama Electric Railway

THE district between the port of Yokohama, Japan's outlet for trade with the Americas, and Tokyo, its capital and largest city, ten years ago was frequently described as "one long village." To-day, a more apt description would be, a " long industrial town." The change in Japanese life brought about by the progress made during the war period 1914-1920 (Spring), has been such that what was formerly pre-eminently an agricultural region supplying farm products to two cities whose populations were about two and a quarter millions, is to-day a building ground for important factories whose needs are only partly served from the population of three millions which have crowded old Yokohama and Tokyo out into the country in a search for more space in which to live. Ten years ago, both Tokyo and Yokohama were beginning to spread beyond their ancient boundaries. The petty Japanese style houses never built with more than two stories, and a Japanese prejudice against living in building with other families (only the lowest classes do that), prevents the growth of large populations in a limited area. It became increasingly difficult to find land within the circumference of the cities to house the growing population.

The line of least resistance was along the Tokyo Bay shore between Tokyo and Yokohama, because along that line there were:

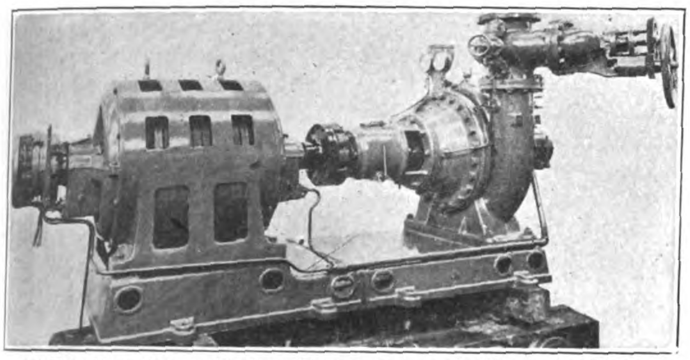
(1) A government railway with several stations at important centres of population between the two cities; (2) an interurban electric railway; (3) a national road none too broad, which furnished the main artery for vehicles, and an even greater hand car traffic between the two cities.

Homes were slowly pushed out into the country and when the great boom in manufacturing industries came, it was only natural that promoters should turn for building sites to localities where the population was greatest. The land between Tokyo and Yokohama also offered convenient transportation to an open port of regular call, as an attraction to factory builders. As factories sprang up between Tokyo and Yokohama, the population of the towns and villages grew by leaps and bounds, and land prices soared. This drove farmers to sell their ancestral holdings, and eventually practically all the land between Tokyo and Yokohama along the main lines of traffic was owned by factories, house builders, or by land companies.

Much of the growth of this district was primarily helped by transportation facilities, and one of the most important of these facilities, is furnished by the lines of the Keihin Denki Tetsudo (Yokohama-Tokyo Electric Railway). The Keihin Electric Railway was first established in 1897 to operate a short excursion line from Kawasaki station, to Rokugo Bridge, near the popular shrine called Kawasaki Daishi, a distance of 1½ miles. The company was capitalized at Y.98,000 and was called the Daishi Denki Tetsudo. Its usefulness was unquestioned and its success immediate. It was not until January 1903, that the present Kawasaki-Kanagawa (Yokohama) section was opened for commercial business, to be extended to Shinagawa (Tokyo), by the end of December 1905. Between Yokohama and Tokyo, commercial transportation is even greater than Osaka and Kobe, despite the common illusion held abroad that Kobe and Osaka are the commercial centres of the Japanese empire, a view usually held by traveling salesmen who

knew nothing of Japanese business methods and consequently found it easier to get orders in less careful Osaka and Kobe than in more exacting Tokyo and Yokohama.

In 1907, the Keihin Electric Railway carried 1,500,000 passengers between Yokohama and Tokyo, but in 1915, when the Imperial Government Railways opened their electric line between the same cities, with stations at all the important population centres, and



500 H.P. Motor Driven Turbine Pump made at the Nagasaki Works of the Mitsubishi Zosen Kaisha

terminals in the hearts of the two cities, the effect on the Keihin line's passenger traffic was immediately disastrous, passengers carried between the two termini, Kanagawa and Shinagawa, both in the suburbs, decreasing to 370,000, and the company's annual dividend rate immediately thereafter fell to the unheard-of low figure 4.8 per cent. Its shares, previously quoted above par (50 yen) fell at once to Y.25.00, a drastic cut. Unfortunately for the Keihin Railway neither its Tokyo nor its Yokohama terminus is in the heart of the city. This has been the great reason for the decline in the number of passengers carried through between Tokyo and Yokohama. However, the loss in through passengers has, to some extent, been made up by the great increase in local passengers carried. And this increase has been particularly marked since the industrial development of the Keihin district began after 1917.

Any transport line operating between Tokyo and Yokohama occupies a position of great importance and has most profitable potentialities. Such towns as Tsurumi, Kawasaki, Kamata and Omori, are only getting started in their industrial stride. As the number of factories increase, during coming years, the number of persons having need of the local services of the Keihin Electric Railway will increase accordingly.

Recently the Keihin adopted a plan to open a new line along the bay shore in a most advantageous position. Even if the official line does run through the same general districts the Keihin line nevertheless performs a most important service in assisting the development of new residence and industrial districts south of Tokyo. South of Tokyo, factories have sprung up everywhere, in Oimachi at Rokugogawa near Kawasaki, and in Tsurumi, the Asano shipbuilding works are also in Tsurumi, while on the reclaimed lands at Koyasu near Yokohama an entirely new residence districts, for Yokohama is now developing. The future of the Keihin Railway is therefore brilliantly hopeful.

The Keihin Electric Railway Co. undertakes the supply of lights and electric power in certain of the towns and villages along its line; in Omori, Iriarai, Oimachi, Kawasaki, Haneda, Tsurumi and 13 villages. The growth of industry in Rokugo and Tsurumi recently has greatly stimulated outside demand for power and light. But between Omori and Kamata the Company meets competition with the Tokyo Dento Kabushiki Kaisha and in Tsurumi it encounters competition from the Yokohama Dento, recently absorbed by the Tokyo Dento. Kawasaki, however, lying between these two belts of competition is a monopoly territory of the Keihin, and the future for its supply of lights and power in that town is extremely hopeful, as Kawasaki is the centre of the new industrial belt south of Tokyo. In the first half year of 1921 the Keihin operated 84,420 lights, of which 14,101 were in Kawasaki, 17,609 in Iriarai, and 10,394 in Omori.

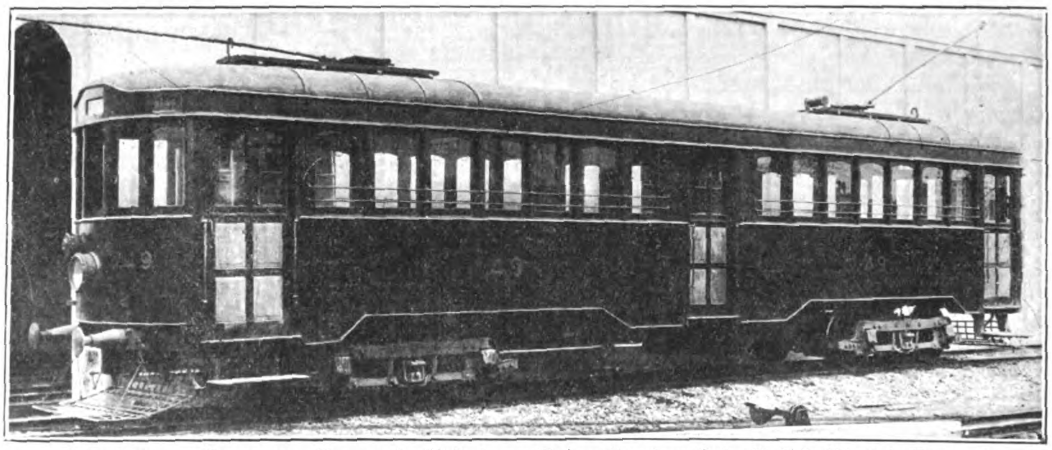
Since September, 1921, an arrangement has been made between the Keihin Dentetsu K. K. and the Gunma Suiryoky Denki Kabushiki Kaisha whereby the two companies act together especially for the supply of power in the district operated in by the Keihin Dentetsu. The Gunma company's power station is not yet completed, but will be ready to supply the Keihin with 6,000 kilowatts by June, 1922. This will make the Keihin self-sufficing for power, and free it from one of its greatest anxieties, competition with the Tokyo Dento on either side of its supply boundaries. Eventually, the Gunma Suiryoku will be amalgamated with the Keihin Dentetsu, the directors of the Keihin say.

The following table shows the growth of this company's light business :

1919	.. .. ..	64,775 lights supplied
1920 June	.. .. ..	71,596 ,,
1920 December	.. .. ..	77,804 ,,
1921 June	.. .. ..	84,420 ,,
1921 December	.. .. ..	91,994 ,,

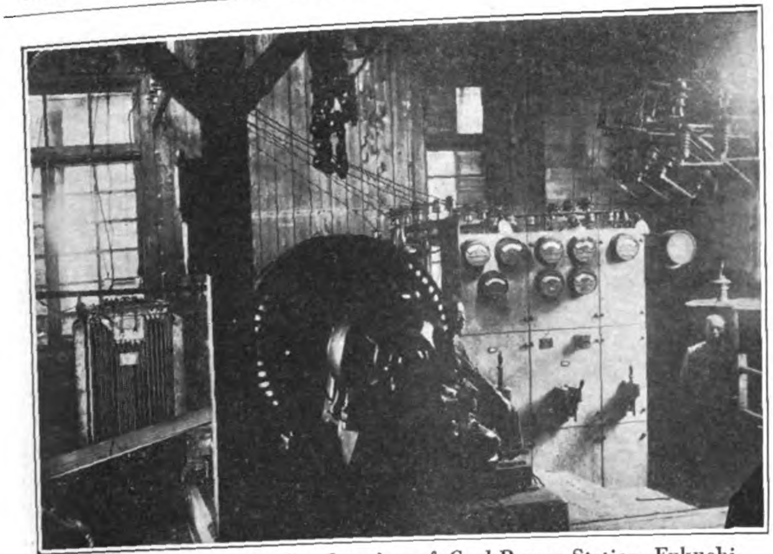
At the same time, despite the slump in manufacturing industries, the quantity of power sold is steadily increasing.

One of the most important questions now confronting the Keihin Denki Kabushiki Kaisha is the problem of a terminus in the heart of Tokyo city. The present terminus, Shinagawa, is extremely difficult to get at, and this inconvenience affects the decrease in the number of through passengers carried between the two great cities. In pursuance of a fixed determination to get into Tokyo from Shinagawa, an arrangement was made for co-operation with the Tokyo municipality whereby the company obtained the right to enter the city by an underground line to be started in two or three years from now. Still another plan is to bring the terminus across the bridge which now separates it from the city and the terminus of the municipal surface lines, and to run the company's cars into, or along side, the Imperial Government Railways' Shinagawa railway station. But against this plan is the fact that there are already eight lines of track now using this station, and there is no space available for widening present accommodation. But the plan has been approved, and the Keihin must bear two-thirds of the expense of necessary construction.



New Type of Passenger Car on the Yokohama-Tokyo Service of the Keihin Electric Railway

A bridge will be built from the present Shinagawa station of the Keihin across to the Shinagawa railway station, but in order to do this the street between must be widened to accommodate the city surface line tracks, and the Keihin Railway tracks, four tracks in all. To do this the street must be widened 90 feet, for



Teikoka Electric Light Co. Interior of Coal Power Station, Fukuchiyama, Tantan District

it is planned to lay the tracks farther apart than they are now laid.

Negotiations are under way for the purchase of the land required for the right of way. This will take some Y.300,000, about one-third of the value of the property. When this arrangement is completed the city tram lines will use the same terminus platforms as the Keihin Railway Co.

A new line already mentioned is to run between Tsurumi station on the government railways to Daishi station on the Keihin line. The line will be built and operated under the name of another company but the Keihin Electric Company owns all the shares. This is a common expedient, because new electric railway companies are not required to pay taxes for two years after the opening of business. After these two years have been passed it will be annexed to the Keihin. The authorized capital of the company is Y.2,000,000, which will probably all be paid up before the amalgamation takes place. It will run through a district very well suited for factory sites, and it is the intention of this company to build a canal to Kawasaki cutting through the district covered by the Kaigan Kido, and with this end in view it has been buying up land on both sides of its projected canal route, and the railway line as well. This land is owned by a "Home Building Company" a subsidiary of the Electric Railway Company.

The national highway running through Kamata will shortly be rebuilt in another place. This will naturally greatly affect the economic growth of this district, as the road will be widened and bettered. The present line of the Keihin Railway is built on the national road for a distance of two miles between Umeyashiki and Minamizoshi. When the road is rebuilt the Keihin will change its present rail equipment to 100-lb. rails, in place of the 61-lb. rails now in use. The change will cost Y.280,000, it is estimated.

A great amount of money will be required to complete the projected canal which is to open the district between Kawasaki and Tsurumi to the sea through a port at Kawasaki on Tokyo Bay. Running south from Kawasaki station, the Asano shipbuilding yards, and the other Asano enterprises at Tsurumi have built accommodation line generally known as the Asano freight line. Along the bay shore south of this line, and to the east of the Keihin line great efforts are now being made to boost the land for use as factory and home sites. The projected canal from Kawasaki will run from Haccho Nawate along the main line of the Keihin Railway through Noda Mura, and along the Ushioda sea shore, past the Asano Steel Works. It will be 8,100 feet long and 120 feet wide. Each bank will be 72 feet wide and especially built up for factory sites. The building work will give the company some 260,000 *tsubo* of land along the canal which can be sold at a profit over and above all costs of original purchase and construction. In June, 1919, it was decided to invest Y.2,300,00 in this scheme.

In June, 1920, Y.1,230,000, in December Y.1,420,000 and in 1921, another Y.1,770,000 was expended, the original appropriation, having proved insufficient. It was estimated that building the banks and the canal would cost about Y.10 a *tsubo* of land obtained from the construction work. If only Y.25 a *tsubo* can be obtained from the land built up and demand is good, a good profit will be made out of the ingenious scheme. The company is now putting the finishing touches to a new line between Omori sea shore passing through Morigasaki to Anamori, and thence to Daishi, Kawasaki. From Daishi to Tsurumi the newly planned Kaigan Kido will connect up this whole territory. The districts traversed by this line are densely populated around Omori, but in other places they are not so well developed. Land is still cheap, and the new line will help to attract home builders. There are no factories in this district, and it is hoped to keep them out, so this territory ought to prove attractive to prospective home builders. Morigasaki is a very fine place. This scheme plans for residence districts between Omori and Daishi, with the factory district south of Daishi extending to Tsurumi.

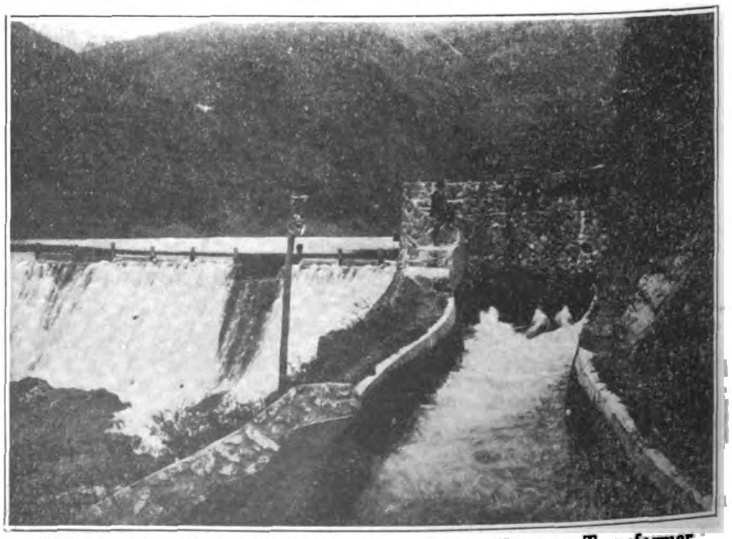
To complete the connection of the line from Anamori to Daishi, it is necessary to bridge the Rokugo River. As the line is now built it is necessary to go to the main line which has a bridge across this river, for through connections. The main line bridge when built cost only Y.260,000, but to build the one needed by the new line will cost, it is estimated, about Y.2,000.000, which is prohibitive. However, Rokugo river is now being banked up and along the embankments factories will be built. If this factory belt is realized then the expense of the bridge can be met from the increased earning the company's line will make by serving it.

The Five Big Electric Railways of the Osaka District

The five big electric railways of the Osaka district (the Kwansai), are the Hanshin Dentetsu K. K., operating between Osaka and Kobe; the Keihan Tetsudo K.K., operating between Osaka and Kyoto; the Nankai Tetsudo, operating between Osaka and Wakayama; the Osaka Denki Kido, operating from Osaka to Nara and the Minomo-Arima Dentetsu K.K., the present Hanshin-Kyuko K.K., operating from Osaka to Kobe, and to Takaradzuka, and to Arima.

Before the war none of these companies, except the Hanshin Dentetsu paid particularly high dividends; their dividends for the second half of 1914 are given in the following table :—

Hanshin Dentetsu..	13 per cent.
Keihan Tetsudo	6 ,,
Hankai Tetsudo	8.5 ,,
Osaka Kido	none ,,
Minomo-Arima Dentetsu..	5 per cent.



Teikoka Electric Light Co. Water Gate at Yamaga Transformer Station, Fukuchiyama, Tantan District

The Osaka Kido was organized and opened for business in the autumn of 1914. During its first term of business it paid no dividends but after a year it was able to pay 7.5 per cent. on preferred shares, and 1.2 per cent. on ordinary shares. But during the seven years from 1914 to 1921, covering the period of war prosperity and panic, all these companies were able to improve their positions, and their dividends for the two terms of 1921 show their advances.

	Profit Rate (per cent.)		*Dividend Rate*	
	First Term	Second Term	First Term	Second Term
Hanshin Dentetsu	25.7	25.4	13	13
Keihan Tetsudo..	15.2	14.	10	10
Nankai Tetsudo..	18.8	21.3	13	13
Osaka Kido ..	13.3	12.4	10	10
Osaka Kyuko ..	17.4	17.9	12	12

(First term from October, 1920-March, 1921.
Second Term from April, 1921-September, 1921.)

The Hanshin Dentetsu shows an enormous profit rate but continues to keep, its dividends down because of the fear of public opinion which is much opposed to the operation of that line through the crowded districts between Osaka and Kobe. It could easily pay 20 per cent. and more, but fear of the consequences deters the directors. The Nankai Tetsudo is in a similar condition, it could easily pay 15 per cent. or more, but is restrained by fear of the company's monopoly of transportation between Osaka and Wakayama being impaired.

The Osaka Kido and the Keihan Dentetsu had heavy construction expenses to meet during 1921, and although their profits on operation were as high as twenty-two and twenty-three per cent., it was impossible to pay dividends like the Nankai and the Hanshin Dentetsu, because of the losses incurred by interest charges on construction works.

The results shown by the Hanshin Kyuko seem to be the worst of all, but this is only because of the new Osaka-Kobe express service line, in which 70 per cent. of the capital of the company is invested. This line has not been long in operation, and construction into the heart of Kobe city is not yet completed. If profits were figured on the basis of the old Minomo-Takaradzuka line, they would have been more than those of any other of the five big companies.

At one time the futures of these companies were looked upon as being rather uncertain, but due to the expansion of industry in the districts served, and to extensions of their services, their futures are now extremely promising. They are, however, all faced with one immediate necessity, that of re-equipping their lines in order to cope with ever-increasing passenger traffic.

It seems natural to suggest that it would be very simple to increase the passenger accommodation by increasing the number of cars to each train. Two or three carriages could be operated like the government electric line around Tokyo. But this change would be accompanied by several difficulties: (1) necessity of improving the present cars; (2) extensions of generating equipment; (3) a complete change of poles carrying the electric wires; (4) rebuilding stations to accommodate longer trains and (5) a general improvement of the railway beds. It is simple enough to effect changes 1 to 4, inclusive, but in improving the railway beds, lies the real problem of increasing passenger accommodation. In order to bring about this change, large amounts of capital are necessary, and there are some parts of certain lines which could not be re-constructed at any cost.

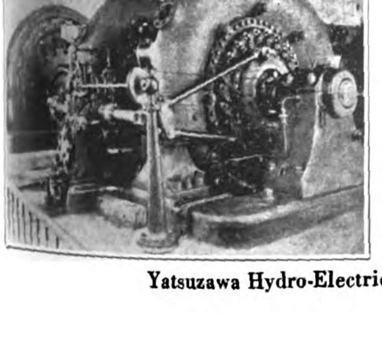
Hanshin Dentetsu

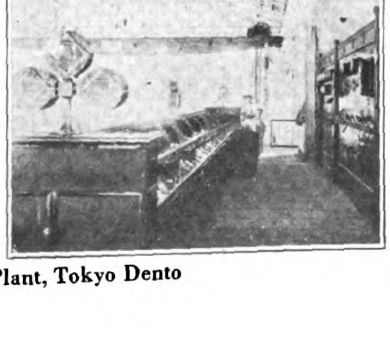
In order to carry out a scheme to operate more than one carriage to a train this company would be obliged to construct a right of way exclusively for railway use. It now uses the principal highways between Kobe and Osaka, running through the most crowded parts of that thickly congested industrial district. It would be essential to re-build the sections between Osaka and Shin-Yodogawa, and between Kobe and Sumiyoshi as elevated railways, so crowded are the streets the present line runs through. By special permission it has been operating two carriage trains since November 1921, but the permission was only granted on condition that the elevated lines mentioned be constructed at the earliest possible date. Consequently, this company can not much longer make such splendid profits. To convert the present railway lines into a right of way exclusively for the use of electric cars, constructing the elevated lines at both ends in Osaka and Kobe, and changing the present 60-pound to 75-pound rails, would cost at least Y.25,000,000. Re-laying the electric wires, improving the cars and reconstructing stations will require another Y.5,000,000. The outside cost would be Y.30,000,000, and the company balks at the expense. A plan has recently been adopted for the construction of a double-track line and the authorities seem to have given their sanction to it. In order to build this new double track at least Y.40,000,000 would be needed. Indecision between the two plans seems to be the reason that nothing has been done so far to relieve a situation fast becoming impossible, especially for the inhabitants of the districts traversed by the company's lines.

Keihan Dentetsu

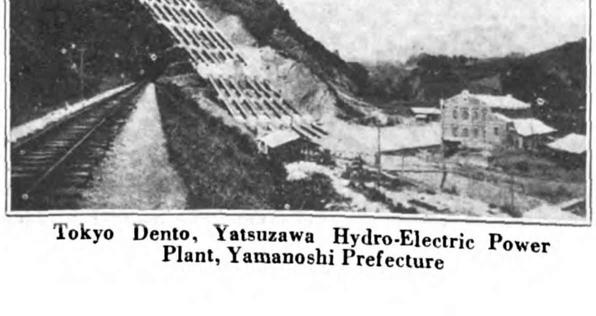
The Keihan Dentetsu runs along the Kamogawa (river) from Osaka to the heart of Kyoto, and the entire roadway outside Osaka is for the exclusive use of trams. This line is about the only valuable property of this company. In Osaka, however, it is in a very difficult situation because the roadbed in the city is not for its exclusive use, and it is under obligation to build an overhead railway. There are also some sections between the two cities where the tram passes through towns where the roadbed is not for the exclusive use of the railway line, and in order to make the improvements necessary to make the lines exclusive for their own use, the company must expend from Y.20,000,000 to Y.30,000,000, almost as much as is required by the Hanshin Dentetsu.

This company has consequently planned the construction of a new double-track line, called the Hokugan line. This line too needs an elevated structure on which to enter the city of Osaka, and in order to obtain an easy entrance, the company recently

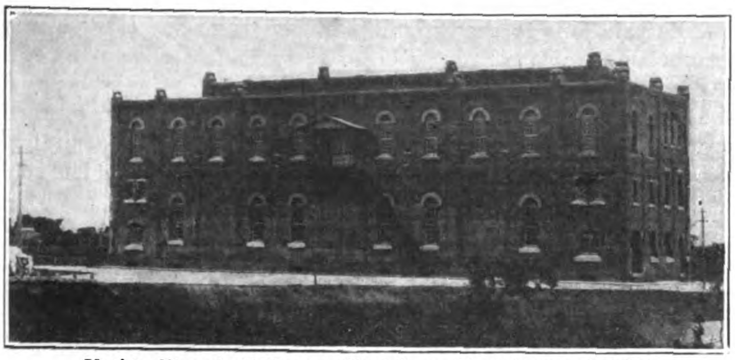




Yatsuzawa Hydro-Electric Plant, Tokyo Dento



Tokyo Dento, Yatsuzawa Hydro-Electric Power Plant, Yamanoshi Prefecture



Keihin Electric Railway. Tachibana Transformer Station

bought the Joto line of the imperial government railways at the very high price of Y.5,700,000. This Joto line too must be reconstructed as an overhead railway, and will require serval millions.

Nankai Tetsudo

On the main line between Osaka and Wakayama, the roadbed having been originally constructed for the operation of a steam railway, it is possible to operate as many cars as the company wishes in one train. There are, however, fourteen miles midway between the two cities which must be double-tracked. This is now under construction. The expense is only two or three million yen, not a great problem for the company. On the other hand, the condition of all the lines of this company is very poor, and the roadbed is very much out of repair.

Hanshin Kyuko Tetsudo

In order to operate trains of two cars or more this company must build a short elevated line into Osaka city. It has still to complete its line into the centre of Kobe city, its present terminus being on the outskirts, a condition which much diminishes the number of passengers who would use the line as a fast service to Osaka. Other parts of the line must also be converted to the exclusive use of the railway. All these important changes can be completed with the comparatively small sum of Y.12,000,000 or Y.13,000,000. The reason this expense will be so low, is because the company planned for these extensions and changes from the beginning, and all construction has been carried out in conformity with this idea.

Osaka Kido

This company was originally projected with a capital of Y.3,000,000, but did not complete its construction for less than Y.8,000,000. The investing public deserted it, and it has been very difficult to stimulate popular interest in it ever since. However, unlike most of the railways around Osaka it laid 70-pound rails all along the line, except for a short distance at the entrance into Nara. Consequently this company is in a position to combine any number of cars in one train without first making any material changes in the roadbed, because of the foresightedness of the promoters.

This company is now planning and constructing a line called the Yamato line. It is not because this particular line will be very profitable, but as the dividend rates of this company are somewhat limited by expediency, the new line has been planned with the object of regulating profits, which are bound to increase as time goes on. Besides this, the plan for the new line becomes excellent material for effecting increases in the present capitalization of the company.

The future prospects of the five electric railways are somewhat as related above, and their difficulties all originated in the failure on the part of their promoters to realize the need of preparing or future expansion when the lines were first laid. The Hanshin Dentetsu for instance, was known to be building a line through the best traffic district in all Japan, still the company failed to exercise wise foresight, and consequently has brought upon itself the rivalry of the Hanshin Kyuko line, which is causing real concern to the present management. The principal reason for the defects in construction of the Hanshin is found in the machinations of a group of speculators on the Osaka exchange, known as the "Hanshinkai." The management of the company is not composed of men with real authority, but is vested in the interests of the "Hanshinkai." Consequently the whole policy of this line has been in conformity with the wishes of speculators, who are not interested in future policies, but present and immediate profits.

The Keihan Dentetsu has many plans, but its chief managers are politicians, and their efforts are always directed to securing "rights." They secured the right of building the Hokugan line, and purchased the government's Joto railways, and they are now planning an extension out towards Wakayama. But the real administrators are not men who are capable of accomplishing any betterment of existing service, in which respect this Osaka-Kyoto line is very much like the Kobe-Osaka line.

On the other hand, the Hanshin Kyuko and the Osaka Kido lines are managed by their original founders, who have taken an active interest in the management of the lines. Naturally the real power lies in the hands of the expert managers, who have no fear of having their suggestions rejected by shareholders who lack confidence in their ability.

The Hanshin Kyuko completed the Kobe-Osaka express line during a period when commodity prices were at their very highest, and yet the cost of construction was not high, judging even by prices ruling to-day, which are much below those of two years ago. This is because the work was planned during war-time prosperity, and was carried out gradually and without haste.

The original promoter of the Osaka Kido lost his position because he expended Y.8,000,000 instead of the Y.3,000,000 allowed for the construction of that line ; however, the present managing director who has been with the company ever since its foundation, is the real power in its councils.

The Hanshin Dentetsu, no matter how great its profits may be to-day, cannot stand the expense of Y.30,000,000 to Y.40,000,000 which will be necessary to reconstruct the line. The Keihan is inferior to the Hanshin Dentetsu in every way, and it, too, must spend large sums to put its lines in order. It can readily be seen, that the profits of these two companies will tend to decrease in the future.

The future of the Nankai Tetsudo is now somewhat uncertain. For a time there was talk of its being purchased by the government, but since this has died down, it is reported that the Seiyukai are trying to get some of their members the privilege of building a competing line. The roadbed of this railway is not very good, but it does not require any great immediate reconstruction. Slight improvements every year will carry it along without decreasing its profit rates.

As for the Osaka Kido, it can put into operation as many cars as it pleases on each train, without making any changes in the present roadbed. The only defect of this line is its poor geographical position, operating through a very sparsely settled district.

The Hanshin Kyuko may have to spend thirteen million yen in order to complete its present plans. Should it enter the city of Kobe, as it intends, this company should become the most important line operating in the Kansai. Viewed in this light, the most interesting feature in the future of these five big electric railways in the Kansai, is the prospects of the Hanshin Kyuko. Just at present its profits are the lowest on the list, but this condition will undoubtedly change soon.

It is thought in Osaka Kobe financial circles that if the Hanshin Dentetsu fails to make the changes needed in its roadbed, or does not soon build a new double line, through fear of decreasing their rate of profits, that it is destined eventually to be absorbed by the Hanshin Kyuko Dentetsu Kabushiki Kaisha, familiarly called by the Japanese the Hanshin Kyuko.

The Kobe-Osaka Electric Express Line

The Hanshin Kyuko railway is one of the enterprises of the Osaka-Takaradzuka Railway Company, which, between those two places with a branch line to Minomo, operates 18 miles of electric railway, and also supplies electric light and power in the vicinity of Takaradzuka and Minomo. It also conducts a real estate and building company. In 1920, the Osaka-Kobe express service line was opened, and a branch line to Itami was completed. In 1921, a new line between Nishinomiya and Takaradzuka was also finished. The present length of the company's lines is 42 miles.

The line between Osaka and Takaradzuka passes through no big towns and many districts are of such a nature that any increase in their population was not to be expected. But when the lines were completed to Takaradzuka and Minomo, many pleasure seekers were attracted to those places for the baths, and through sales of land at cheap prices, and extensive building operation the districts around these two places have gradually been developed, so that to-day the results are most noticeable in the company's business statements.

TABLE I. PAID-UP CAPITAL. PROFITS AND DIVIDENDS.

	Paid-up Capital	Profits	Dividend Rate per cent.
1918, 1st half year ..	Y. 4,400,000	Y. 301,000	8
1918, 2nd half year ..	5,390,000	397,000	8
1919, 1st half year ..	6,875,000	377,000	8
1919, 2nd half year ..	7,494,000	402,000	8
1920, 1st half year ..	12,275,000	772,000	10
1920, 2nd half year ..	12,275,000	917,000	10
1921, 1st half year ..	18,000,000	1,119,000	10

There has been a great expansion in the value of the company's property since 1918.

TABLE II. VALUE OF PROPERTY OF HANSHIN KYUKO RAILWAY CO.

	1921 1st half-year	1918 1st half-year	Increase
Construction Expenditures	Y.16,662,000	Y.6,248,000	Y.10,414,000
Building Imatsu Generating Station ..	3,742,000	—	3,742,000
Land and Buildings ..	1,127,000	677,000	495,000
Light and Power Costs of Equipment ..	2,383,000	443,000	1,940,000
Total	Y.33,959,000	Y.7,368,000	Y.16,591,000

The fixed capital of the company increased Y.16,591,000 in the three years from 1918 to 1921, but the cost of construction of the Osaka-Kobe express line, 17 miles and the Itami branch 19 miles was Y.10,414,000. The Osaka-Kobe line was begun in September, 1918, completed in 1920, and put into operation on July 16 the same year. But the results of business cannot yet be positively regarded, it is necessary to consider several other matters first.

When the Imatsu power station was first planned it was intended to build a generating station for 10,000 kilowatts, consisting of 5,000 kilowatt generators. Later it was seen that there was much disadvantage in having only two generators to operate and so it was determined to add one more 5,000-kilowatt generator to the equipment. This third generator will be kept in reserve, 10,000 kilowatts being the maximum requirement for power. This plan was adopted in the days when finance was easy, but since the hard times set in demand for power has noticeably decreased, and the boundaries of supply in which this company operates are not sufficiently extended to consume all the power that this new plant will generate. This state of affairs has naturally much upset the company's calculations, and recently negotiations were concluded with the Ujigawa Denryoku Co., by which the latter company puts up the capital to take over the plant and operate it. So the 15,000 kilowatts is to go to the Ujigawa, and the Ujigawa will supply 5,000 kilowatts to be used by the Hanshin Kyuko line. Up to the present time there has been no profit on the capital invested in this power plant, but there were debts of Y.3,000,000 which were included in the costs of construction, so it has been difficult to make any profit on the investment.

A general consideration of the expansion of equipment and income of the company will show that the reason the rate of profit has not increased during the past few years has been the cost of constructing the Osaka-Kobe express line.

TABLE III. INCOME AND BUSINESS.

(000 omitted)

1918, 1st half ..	Y.490	—	Y.134	Y.140
1918, 2nd half ..	519	—	137	137
1919, 1st half ..	673	—	152	109
1919, 2nd half ..	711	—	173	313
1920, 1st half ..	967	249	208	249
1920, 2nd half ..	898	571	221	345
1921, 1st half ..	1,029	641	426	460

It can easily be seen from this table that income is gradually increasing. Until the end of 1920 the income from the Takaradzuka line gradually increased, but it fell off in the second half of 1920, only to increase very markedly in 1921. This is a holiday-making line, and is used by merry-makers from Osaka business is usually good, but the panic of 1920 stopped a great deal of holiday spending, and the line did not recover from this until the first half of 1921 when the spring season tempted holiday seekers out to Takaradzuka again.

The Kobe-Osaka line was only opened two months in the first half of 1920, but in the second half it earned Y.571,000, and in the first half of 1921, reached earnings of Y.641,000. Unlike the Takaradzuka line the Kobe-Osaka line is not affected by the season's gaieties, and it is developing steadily in the most satisfactory manner.

Up to the first half of 1921 the rate of increase of this business was steady, and in that term the Inagawa Company was annexed in the first half of 1921 this income was about 20 per cent. of the total.

With the object of harmonizing its whole income the company carries a large amount of temporary loans, to keep down dividends.

Like other light and power companies operating electric railways it is necessary to look at from the point of view of its income from the railways it operates. In 1921, first half, the income from the Takaradzuka line was Y.1,029,000 and from the Kobe line Y.641,000. The income from the Kobe line was 63 per cent. of that from the Takaradzuka line, but the number of persons traveling is greatly different.

TABLE IV. PASSENGERS ON ELECTRIC RAILWAYS.

	Takaradzuka Line	Kobe Line
1918, 1st half	5,002,000	—
,, 2nd half	5,109,000	—
1919, 1st half	5,759,000	—
,, 2nd half	6,465,000	—
1920, 1st half	7,009,000	828,000
,, 2nd half	6,556,000	2,226,000
1921, 1st half	7,728,000	2,584,000

In 1921, first half, the number of passengers on the Kobe line was not one-third of that traveling on the Takaradzuka line but the income was 63 per cent. There is room for a great expansion of population along the Kobe-Osaka line which does not run through the main populated villages, but lines rather far away from such

towns as Nishinomiya, Koroen, Ashiya, Sumiyoshi, etc., so that the future of this line is extremely promising.

Speaking of the Kobe-Osaka line it is necessary to call attention to the fact that there are many electric lines in the suburbs of Osaka which were laid down very carelessly along the lines of touching the districts in which most passenger were to be found. They were built along the main streets, and now when traffic has increased so enormously can no longer operate at high speeds. The new line warned by these examples owns its own roadbed, and nowhere uses the public roads. Its roadbed, rails, wire carriers, and in fact, all its equipment is of the latest standard, and finest make, and cars can accordingly be run at very high speed. The time on this line between Kobe and Osaka is only 40 minutes, while on the Hanshin electric railway, a separate company, it takes an hour between the two cities. In the first half of 1921 the Hanshin electric carried between the terminals at Kobe and Osaka 2,600,000 passengers. The Hanshin Kyuko about half that number of through passengers. The reason so many passengers patronize the Hanshin electric instead of the Hanshin Kyuko is because the terminal in Kobe is in the heart of the city. The Hanshin Kyuko terminal is in the suburbs and very inconveniently located. It is now necessary to build into the city itself, but because of a plan the municipality has for beautifying Kobe city, the railway company must enter by an underground line which will cost a prohibitive sum, and take too long a time. A request has been presented to the authorities that they permit the construction of an elevated line instead.

This will take three years to build. But it will have its terminal in Motomachi 1-chome, near Sannomiya station. And because of some street plans of the city of Osaka the company will also have to build an elevated into the heart of the city of Osaka from Jussan. This line will have a double track. Expenses of constructing the elevated in Kobe are estimated at Y.7,000,000, and from Jussan to Osaka Y.3,500,000, to which preliminary expenses of Y.500,000 must be added, bringing the total to Y.11,000,000. To raise this sum the capital must be increased, but if this is done the rate of income will not be sufficient to attract capital. So it is planned to raise a company loan which will pay 8 per cent. interest. This will be cheaper than raising capital, which nowadays requires at least 10 per cent. returns in order to be attractive to investors.

The following statement of the liabilities and assets of the company was published at the end of the first half of the fiscal year 1921:—

TABLE V. ASSETS.

Unpaid Capital	Y.6,000,000
Construction Costs	16,662,128
Imatsu Generating Station Construction Costs	3,741,637
Cost of Land and Buildings	1,172,005
Land and Buildings sold oni nstalments not yet paid	954,187
Power and Light Equipment	383,245
Tools, etc.	15,959
Goods in Warehouses	393,447
Bank Deposits	234,288
Negotiable Securities	23,442
Temporary Payments	43,939
Uncollected Income	89,032
Cash on hand	20,974
Total	Y.31,734,337

TABLE VI. LIABILITIES.

Capital	Y.24,000,000
Company Debentures	2,000,000
Legal Reserve	352,200
Special Reserve	181,500
Dividend Equalization Reserve	200,000
Reserve for Bonus	52,898
Deposits of Company Employees	70,820
Money Deposit for Character Guarantees	30,936
Temporary Loans	3,000,000
Temporary Petty Loans	155,397
Unpaid Dividends	26,980
Unpaid Interest on Debentures	61,009
Other Unpaid Accounts	277,073
Carried over from Previous Term	206,805
Profit for the term	1,118,716
Total	Y.31,734,337

The future estimate of business counts on 10,000 passengers a day riding between Osaka and Kobe. If this is possible to realize then it will not be difficult for the company to pay a dividend of 10 per cent., even if it is necessary to borrow enough money to pay for the improvements required in Kobe and Osaka. These passengers will pay 40 sen each, and the profits from the traffic is expected to increase Y.500,000 a term. This will be a sum sufficient to meet all interest charges and leave a slight balance for payment of dividends.

Taking into consideration the important industrial district through which the new Kobe-Osaka runs, the future of the line should be very promising indeed. As the lands fill up with factories and home makers the company's revenue will increase from passenger service, freight service, light and power service, and from the sale of land and buildings on the instalment plan. The Takaradzuka pleasure resort grows more popular every year, and will eventually become one of the greatest pleasure resorts in the Far East when all the improvements planned are instaled.

Iron Ore in the Malay Peninsula

IN the report for 1920 of the general adviser to the government of Johore, mention is made of the opening of an iron mine on the left bank of the Batu Pahat River, a mining concession over 50 acres having been issued to a Japanese. The ore is mainly hematite, containing about 65 per cent. of iron, and there is sufficient ore in sight for five years' working. Later information to hand, down to the end of September, shows that the deposit is being actively worked, and the monthly output is now 8,500 tons of ore of excellent quality. The ore is being shipped to Japan. It is reported officially that similar deposits are known to exist in Johore and other parts of the Malay peninsula. As regards the question whether the ore can be produced at a price that would find for it a ready market, Mr. Isheharo, managing partner of Nanyo Kogyo Koshi, who is in charge of the mining operations at Bata Pahat, has contributed an article to a Singapore newspaper in which he states that hematite ore is the commonest form in Malaya. Magnetite is also found in some quantity, but limonite is less frequent. He discusses the possibility of smelting the ore in Malaya, and arrives at the conclusion that, at present at least, it would be useless to attempt to smelt the ore locally. The price for which the ore can be sold in India is given as $2, in China $3 and in Japan $8—the value of the Straits Settlement dollar being 2s. 4d. If exported to India or China, the price would not be enough to pay for the freight; but if a specially low rate were given to Japan, it would be possible to dispose of the ore there at a profit. Japan's requirements are 1,200,000 tons of ore yearly. Half of that amount is already mined in Japan, and the remainder has hitherto been supplied by China. These ores contain from 50 to 60 per cent. of iron, and are bought at $8 per ton, whereas the ore from Malaya contains 65 per cent. and is worth about $10.50, though it has been sold at $10 in order to compete with ore from other sources. The usual freight to Japan is from $7 to $8 per ton, and other expenses are about $3 per ton. At these rates, it is obvious that it would be impossible to mine and market the Johore deposits at a profit, so the Japanese company charters steamers which would otherwise be returning in ballast to Japan. In the course of a year some 50,000 tons of cargo space is available in this way and the Japanese miners are able to export the ore at the freight of $5.50 per ton.

The University of Hongkong

The Work and Equipment of the Engineering Faculty

By C. H. MIDDLETON SMITH

THE importance of technical education in China is more appreciated to-day than it was a few years ago. The purpose of the engineer is to develope the vast resources of nature for the use and convenience of mankind. That China possesses vast natural resources will probably not be disputed. Everyone who has traveled through the various provinces has been impressed by the evidence of latent mineral wealth. Experts who know China are enthusiastic on this subject. They see that not only is there immense latent mineral wealth, awaiting liberation in order to benefit greatly the world and China—and China most of all; there are also vast possibilities of improving the vegetable wealth by the application of scientific knowledge in the way of water supply, transport, etc. China offers, at hand, an almost inexhaustible army of intelligent and most industrious workmen. What then is retarding the development of the great natural resources of the country when it is so obviously to the benefit of everyone that these resources should be made available for the use and convenience of mankind?

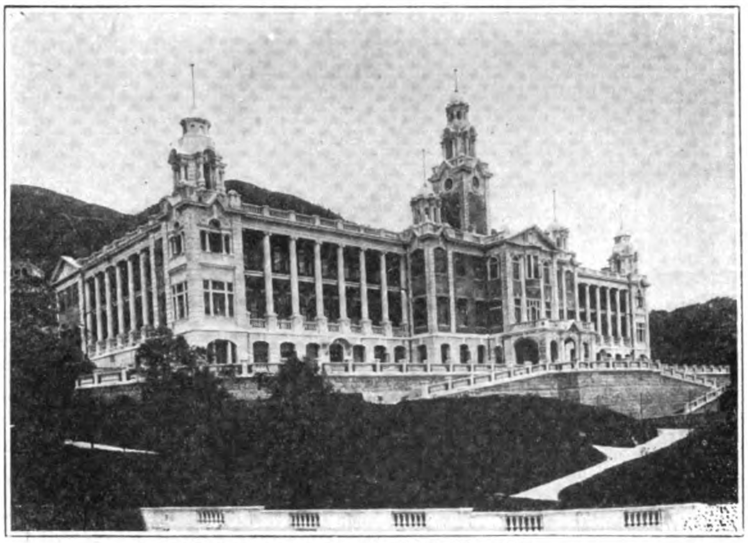
The answer is quite simple. This greatly desired utilization of the gifts of nature has not yet taken place because of ignorance. It is useless to regret; sometimes it is waste of time even to enumerate the past mistakes of nations or individuals. The practical man accepts the present position and wastes neither energy nor time over regrets, but sees what is desirable and works for that end.

Until quite recent times the Chinese have been entirely ignorant of modern scientific methods. Even to-day only the merest fraction of one per cent. of the population have any notion of what is meant by the word "Engineer." The number of Chinese technical men qualified by training and experience to become full members of the British institutions of civil, mechanical or electrical engineers is probably less than a hundred. The population of China is ...t about 400,000,000. ...bly nearly 10,000 ...lly qualified engineers (out of a population ...sponding to China's one hundred. There ...f young Chinese who have been trained ...erica during the last twenty years ...llent work. In due time they ...n order to carry out with success some of the more urgent engineering schemes in China. Their weakness is usually inexperience, and a training not always very suitable for the peculiar conditions that obtain in China. It is not too much to say that with settled political conditions and a more general appreciation of scientific work on the part of government officials and bankers, there would be useful employment for hundreds of thousands of Chinese professional engineers in the vast territory of their own country. Foreign engineers will for many years be needed to give advice as experts on special problems, but the natural resources of China will never be developed until the Chinese themselves understand and can carry out engineering projects.

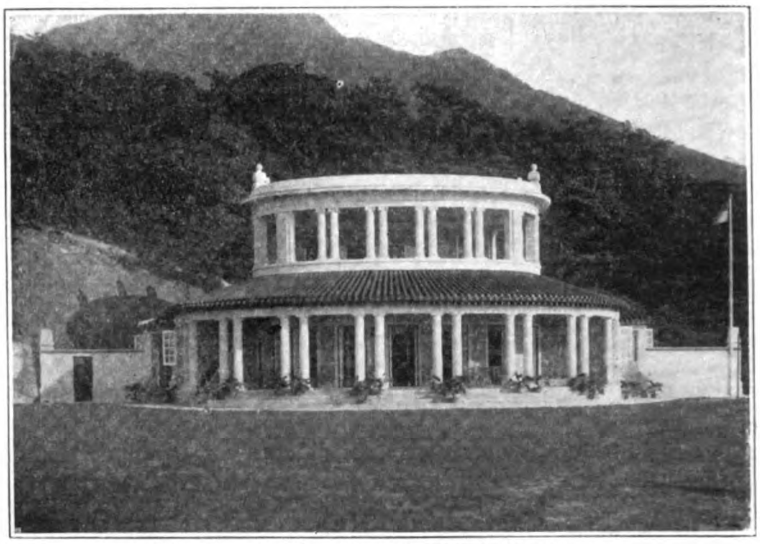
SIR WILLIAM EDWIN BRUNYATE, K.C.M.G.
Vice-Chancellor and Principal of the University of Hongkong

An Object Lesson

A few months ago an engineer whose fame is world-wide addressed the students of the University of Hongkong. Sir Maurice Fitz Maurice, although visiting Hongkong to give expert civil engineering advice on problems connected with the harbor, showed great interest in the aims and work of those giving and receiving technical education at the local university. He remarked that never, in all of his world-wide travels, had he visited a place where there were, within a short distance of each other, so many different examples of the work of the engineer. He said that, within about three or four miles of the hall in which he was speaking, there were three large and up-to-date dockyards, in two of which ocean-going ships were being built, while the third undertook the repairs of the largest ships on the Pacific. There were also, he said, a number of small engine and ship-repairing yards. Other works that he mentioned were the four quite big electrical power stations—two using steam turbines, one with slow-speed reciprocating engines and the other working with gas engines. Then he mentioned the various activities of the very efficient local public works department. The splendid motor roads, built in the face of almost insuperable difficulties; the water supply system with its various reservoirs; and the great dam at Tytam, the biggest thing of its kind East of India; the many modern factories whose products range from cement to cigarettes or from rope or leather; the steam railway on the mainland with its locomotive works and the unique cable tram that hauls a coach by means of a wire rope up to a height of about 1,200-ft.; the electric tramways on



Hongkong University, the Main Buildings
(These buildings include lecture rooms and laboratories. Residential quarters are within a few minutes' walk)



Hongkong University, the Athletic Pavilion
(This is a building situated on the Recreation Ground which is about half-a-mile distant from the University main buildings). The University sports, cricket matches, tennis and other competitions are notable part of student life)

the island and the automobile repair shops such as are to be found only in four or five places in China ; the sight of the seaplanes, the wireless masts and the great variety of shipping in one of the finest harbors of the world ; the reinforced-concrete buildings, the ice-factory and the systematic drainage and public health work ; all of these things, and many others, were mentioned by the famous expert as object lessons and inspirations for the young engineer in training in Hongkong.

The Engineering Graduates

It should be explained that the purposes of some of the founders of the university were made evident by the fact that the first chair founded at Hongkong was the Taikoo chair of engineering. For a whole year 1912-13 there was only one professor in the university and his work was engineering. In that first session fifty-four undergraduates enrolled in the faculties of medicine, engineering and arts and of those fifty-four no less than thirty-seven elected to take the engineering courses.

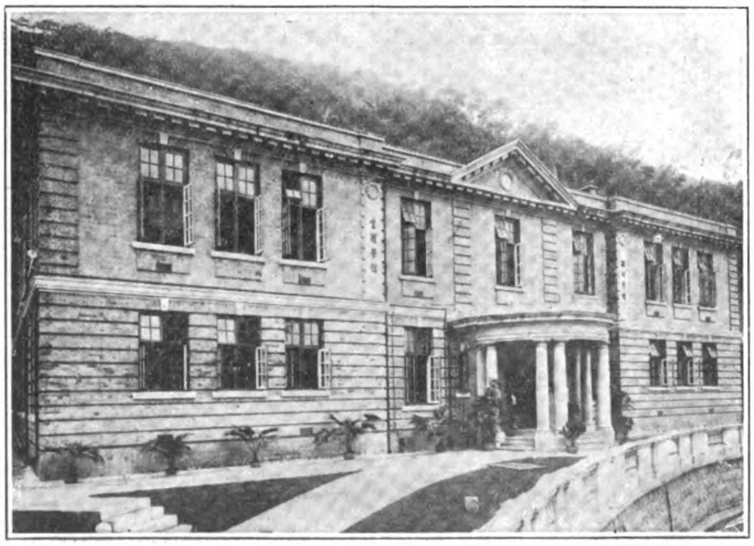
At present (1922) there are 132 graduates of the university who have passed the necessary examinations. Of those the graduates of the various faculties are as follows : Medicine, 46 ; engineering 77 ; arts 19.

Of the engineering graduates 42 specialized in civil engineering, 16 in mechanical engineering and 19 in electrical engineering.

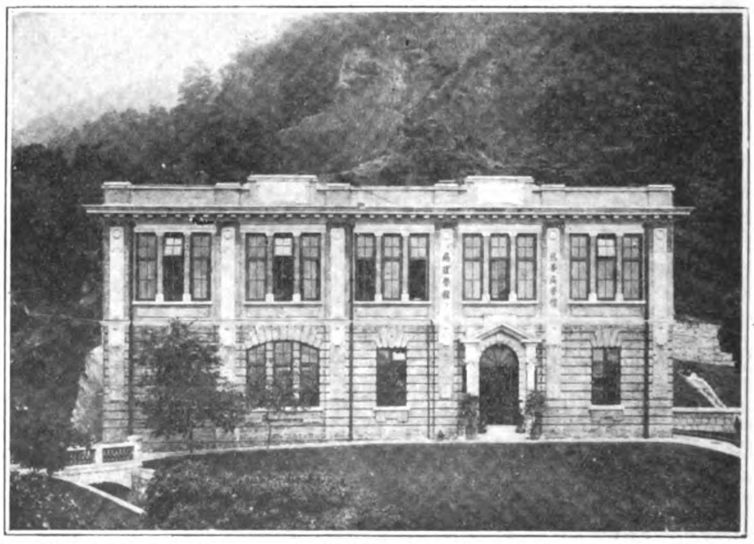
Of the engineering graduates, five have been awarded first-class honours degrees, and 18 second-class honours. These awards are made on the recommendation of examiners of the University of London who have certified that the honors standard of the engineering degree of the University of Hongkong is the same as that of the University of London.

The details of the work done by the engineering students will be given later. Suffice is to say now that, in general, the technical instruction given at Hongkong is similar to that given in the University of London. The only differences are these. In London the course after matriculation can be completed in three years whereas in Hongkong the course takes four years. That is to make allowance for the defective teaching of science in the Far Eastern schools which act as feeders to the University of Hongkong and also because of the language difficulty and the entire novelty of any engineering work to the majority of Far Eastern students. In London the engineering student is allowed a free choice of certain engineering subjects in his final examinations. In Hongkong he must study the elementary work of civil, mechanical and electrical engineering in his first three years at the university. During his final year he selects to specialize either as a civil, mechanical or electrical engineer. In actual fact some students have elected to stay a year after graduation in order to study one of the other courses.

The object of this arrangement is fairly obvious. In an undeveloped country, such as is China, it is essential that every



University of Hongkong, Medical Buildings, Schools of Anatomy and Physiology



University of Hongkong, Schools of Tropical Medicine and Pathology

engineering graduate should know the elements of the three branches of engineering. In his work the civil engineer needs to know how engines work and the principles of various mechanisms as well as requiring a knowledge of electric power. Similarly the mechanical or electrical engineer needs to know the principles for the design of structures, etc.

The engineering students of the University of Hongkong have come from all parts of the Far East. They have traveled to their *alma mater*, from Penang to Peking, from Java, Siam, Australia, India, and other lands and from nearly all of the eighteen Chinese provinces but especially from Yunnan, Chihli, Hupeh and Kwangtung. Mostly the sons of merchants, some of them come from families of officials. Some of them, especially those from the Malay Federated States, cannot speak Chinese at all; many of them speak Chinese dialects which are intelligible only to those of their fellow students who come from the same districts. All of them speak and write English, for the entrance, or matriculation examination is conducted in English with various compulsory papers to test especially, their knowledge of the English language. All of the technical lectures and instruction is given in English.

The Beginnings

As we glance rapidly over the history of the nine years since, in 1912, the university opened its doors to students, it seems almost incredible that so much has been accomplished. It is not proposed to go over the full story of the inception and the working out of the idea of technical instruction in Hongkong. That is to be found in the university calendar which is published annually and which may be had on application to the registrar of the university or the dean of the faculty of engineering. There are, however, a few facts of interest not set forth in the calendar and one or two of them may be related.

Firstly, it may be acknowledged that when the university opened its doors in 1912 its financial resources were entirely inadequate for the work which it was proposed to do. After ten years its annual revenue is almost four times as great as it was in 1912 and that fact of itself demonstrates beyond cavil that there are people in China who wish to encourage and develop this institution. It would be foolish to suggest that the technical departments of the university do not require further funds; there is probably no technical institution in the world that does not wish to improve its equipment and work; in China, more than any other part of the world, there is the possibility of enormous expansion in technical education. In the University of Cambridge, England, there are now about 1,100 engineering students as compared with, say, 200 in pre-war days. In the University of London the number of engineering students is probably four or five times as many as were at work there ten years ago. In the universities in America the engineering graduation classes include many hundreds of students. As the facilities at Hongkong are improved, and the opportunities for studying engineering are more generally known, there will be many hundreds (perhaps thousands, of technical students. At present about twenty new students are enrolled in the engineering faculty each year and the total number of such students is under a hundred. Let us now consider the work which they do during their four years of study and the type of life they lead during their careers as undergraduates.

The Training

Although students not studying for a degree may be admitted to lectures and technical instruction, the experience of the past ten years has proved that very few students take the engineering courses except with the hope of obtaining a degree. Throughout the four years' course the engineering student spends about two hours each day at lectures and four hours in the laboratories, workshops or drawing office. The first two years are occupied in instruction in physics, chemistry, mathematics and mechanical engineering.

In the third year the student spends the whole of his time at work in the subjects called prime movers, materials and structures and electrical technology. These are really the basic subjects needed in mechanical, civil and electrical engineering. Surveying is also done by certain students.

In the fourth year the course is more specialized. The future civil engineers take structures, surveying and hydraulics. The future mechanical engineers take prime movers, electrical generation and distribution and design of engines and machines. The students specializing in electrical engineering take the first two subjects in common with the mechanical engineers and electrical design as a third subject.

The Cost of Technical Education

It must be confessed that the original promotors of the university did not realize that modern engineering instruction requires a great deal of money to be spent on buildings—especially designed as laboratories and workshops equipment and staff. Let it be assumed for a moment that there is no technical education in Hongkong and that it is proposed to create only a school of engineering (civil, mechanical and electrical) of a university type. The following is a rough estimate of the cost:—

First of all a site for a building is needed, giving a ground floor area of about 50,000 sq. ft. (say 115 acres) for offices and buildings for instructional purposes. To put it in another way, the present floor area actually occupied by the lecture rooms, drawing offices, laboratories and workshops used by the engineering students (including physics and chemistry rooms) is 29,200 sq. ft. Plans are in preparation for extensions which will cover a floor area of about 45,000 sq. ft. In these days of increased cost of buildings these various rooms, laboratories offices and staff and students' residences for the faculty of engineering only would cost about a million and a quarter dollars. There is also the site, which would be very costly.

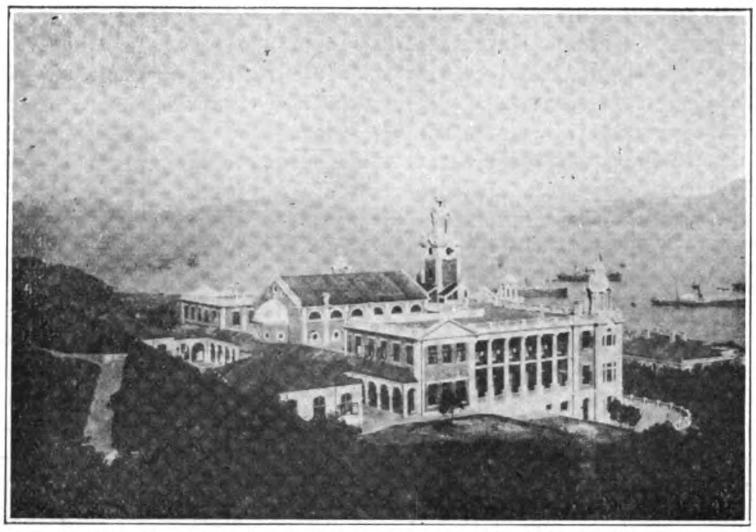
The present equipment now used by the engineering students may be valued at £40,000 and it is hoped to increase the equipment by machines valued at £20,000, in the near future.

Students' common rooms, residental quarters, recreation grounds, etc., also cost money.

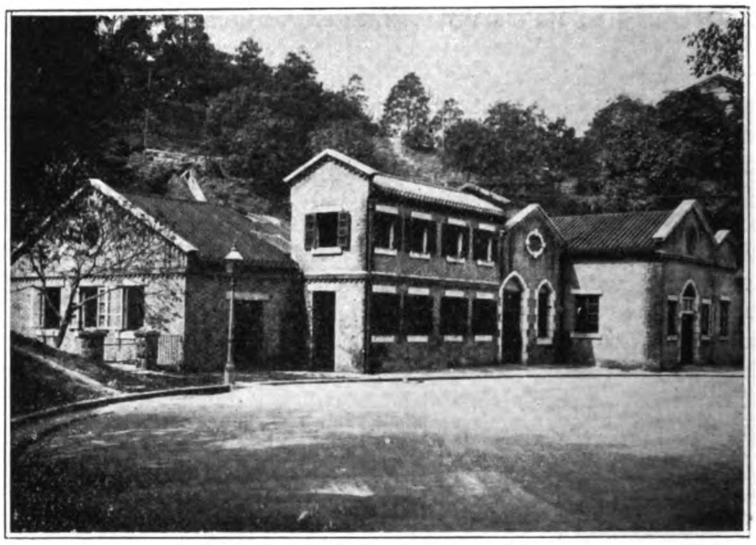
To re-create a school of engineering at Hongkong such as exists to-day would cost about 2½ million dollars for capital outlay on land, buildings and equipment together with a capital sum of at least one million dollars for endowment purposes for payment of staff and general maintenance of buildings and equipment. That is assuming that there would be as at present, a steady income from students' fees which are $300 a year for instruction and $240 a year for board and residence. A solely technical institution is less educative than a university which includes students in medicine, arts, education and commerce; it cannot be sufficiently emphasized that the student learns lessons about life by meeting students of other branches of learning. We have, however, no space to elaborate on the cost of a modern university.

The balance sheet and accounts of the university at December 31st, 1921, were published and we have made a few interesting excerpts. The total assets are given as $4,365,498, of which buildings and equipment total $1,359,150 and investments (for endowments) $2,899,061. We very much doubt whether any other educational institution in China, with the exception of the Union Medical College of Peking, has such a strong financial bases as an endowment fund of nearly three million dollars, in addition to buildings, equipment, etc., valued at $1,359,150. The land is not regarded as an asset, and its value is therefore in the balance sheet as it is in reality a trust; but a conservative estimate of the value of one million square feet at West Point, Hongkong, is one million dollars.

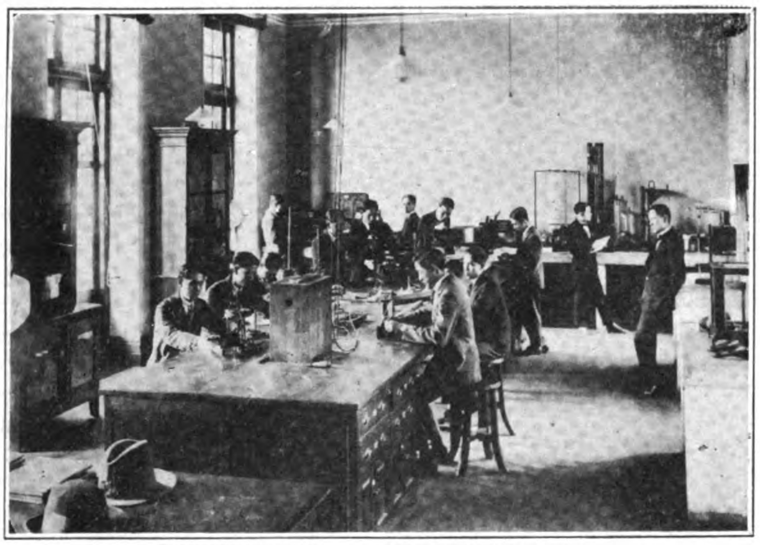
The annual income during 1921 seems to have been nearly $400,000 and it is worth nothing as an indication of the progress that, in 1914 (eight years ago) the annual income was less than $150,000.



University of Hongkong, General View of the Main Buildings

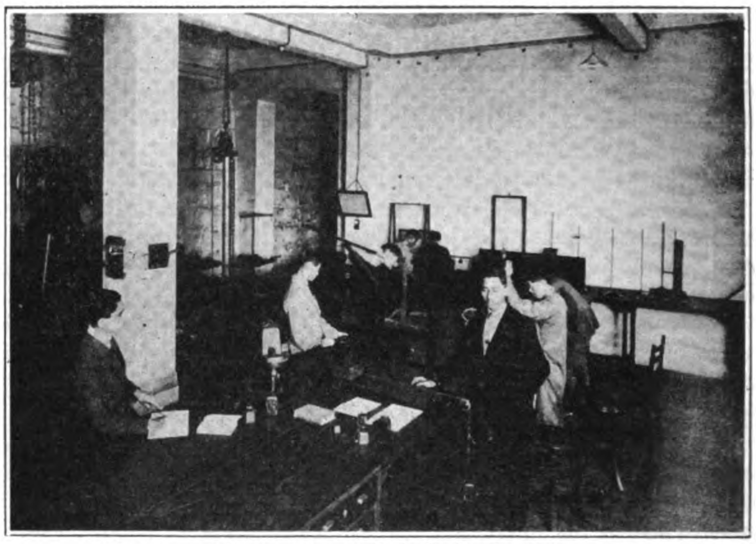


University of Hongkong, Steam and Hydraulics Laboratories



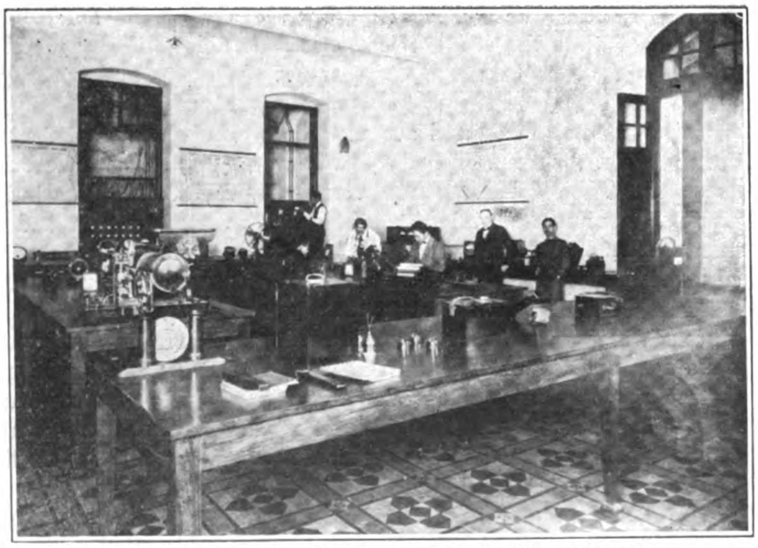
Hongkong University, Physics Laboratory

(This picture shows engineering students in the early stages of their training at work in the physics laboratory)



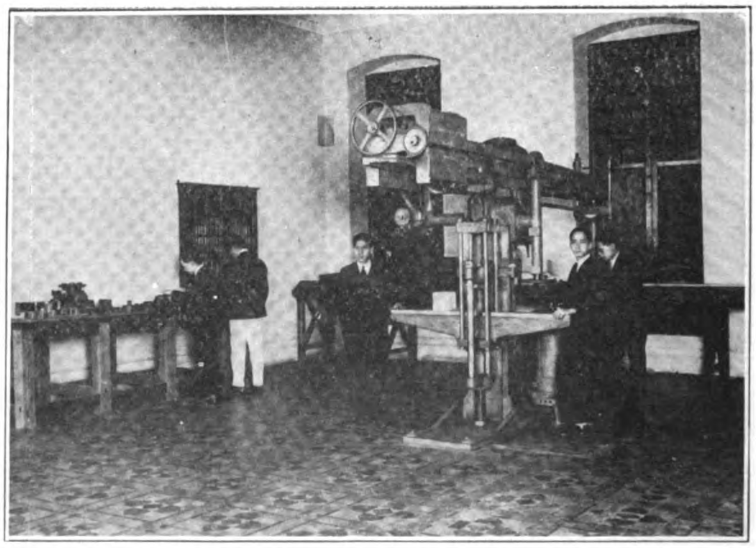
Hongkong University, applied Mechanics Laboratory

(Engineering students are here seen making experiments in applied mechanics. This work teaches them technical terms and applied mathematics as well as general engineering principles in their first year)



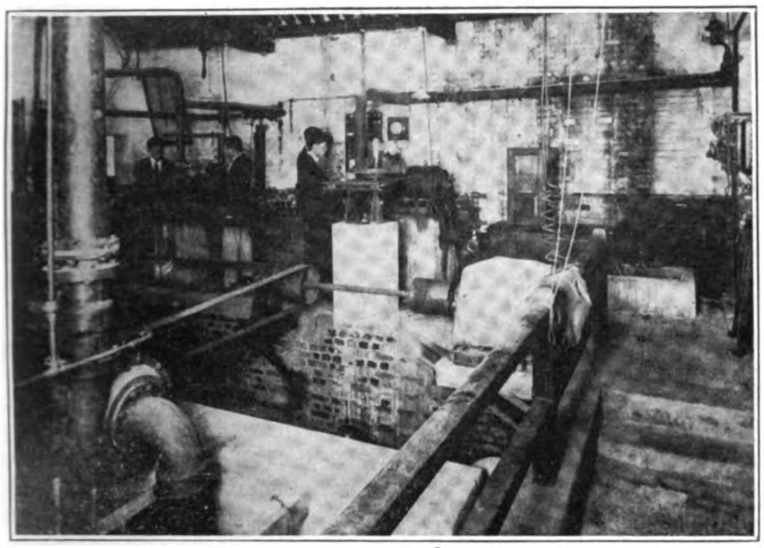
Hongkong University, the Electrical Technology Laboratory

(In this laboratory experiments in connection with measurements of resistances, small cements and instrument tests are carried out)



Hongkong University, Strength of Materials Laboratories

(This picture shows a 30-ton testing machine which is electrically controlled)



Hongkong University, the Hydraulics Laboratory
(Students are here seen testing a small Pelton wheel and electrically driven centrifugal pump. Other pumps, tanks, channels, etc., provide further experiments)

The engineering faculty has been fortunate in obtaining practical support. Messrs. Butterfield & Swire, Ltd., and associated firms, gave £40,000 to the original endowment fund and have since presented $100,000 for the engineering work. The Taikoo chair is named after the firms. Sir Robert Ho Tung has recently given $100,000 for new workshops.

These figures have been quoted, not with any intention of suggesting that the endowment fund is adequate or that further money is not required. In actual fact plans are being prepared for extensions of the engineering laboratories and workshops which will require at least half a million dollars for completion.

Fortunately there is, at present, no need to duplicate this great expense on behalf of technical education. It is possible to increase the accommodation in Hongkong for 500 technical students at some additional expense but at nothing like the expense involved for even two similar schools of engineering with only a hundred students each. One hundred students can listen to a lecture as attentively as ten of the subjects is interesting.

Excluding the professors of physics, chemistry and mathematics, there are at present seven full-time professors and lecturers, a workshop instructor and a demonstrator (all from England) on the staff of the engineering faculty. They hold the same qualifications as the staff in similar positions in the universities of England. There are also Chinese graduates as demonstrators and a number of workmen needed for maintenance of equipment and the electricity supply system for the whole university.

It must be remembered that in addition to the technical staff there is the general administrative staff of the university including the vice-chancellor, and the registrar concerned with all three faculties of the university.

Workshops and Laboratories

During the last nine years there have been many thousands of visitors to the university. They usually find great interest in the scientific equipment and the machinery which is at work.

The first engineering building visited is generally the electrical power station. This is a separate building adjacent to the main university building. It is about 60-ft. by 60-ft. It contains numerous gas and oil engines many of which are used for the supply of electric light and power and all of which are used by the students for testing purposes.

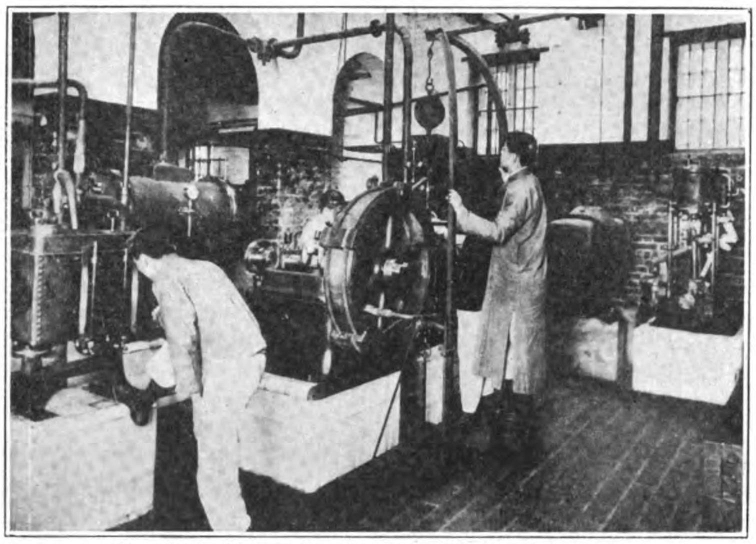
The equipment in this building consists of (1) 35 B.H.P. Campbell gas engine with suction producer coupled direct to a 20 K.W. G.E.C. (London) dynamo; (2) a 15 B.H.P. Crossley gas engine using either town or suction gas, coupled direct to an 8 K.W. Lancashire Dynamo Motor Co. dynamo; (3) a 10 B.H.P. two cylinder Gardner oil engine coupled to a dynamo; (4) an 8 B.H.P. Campbell semi-diesel oil engine coupled by chain to a 7 K.W. dynamo; (5) a 15 B.H.P. Campbell vertical oil engine driving a 7.5 K.W.D. dynamo; (6) a 25 B.H.P. Daimlet silent knight petrol engine; (7) a 7½ B.H.P. Thornycroft marine motor; (8) a 7 8 B.H.P. Ruston Proctor portable oil engine; (9) a 9 B.H.P. Westinghouse cross oil engine driving a Reavell air compressor; (10) a 4 B.H.P. Turner paraffin engine coupled to a Siemen's dynamo and also fitted for brake tests; (11) a so-light Lister Bruston automatic plant (driven by a petrol engine).

Adjoining the power station is the workshops. The machine and fitting shop is 60-ft. by 30-ft. It contains a motor-driven craven planing machine; a motor-driven Hulse shaping machine; a motor-driven Archdale radial drilling machine; a motor-driven combine tool and dry grinding machine and a 3¼-in. motor-driven Drummond lathe, a 6-in. Lang lathe, a 5-in. Buck and Hickman lathe, a Dickinson lathe, a 5-in. Spencer lathe, a Ward capstan lathe, a Milne lathe, a Kendoll and Gent screwing machine, a 10-in· Selson shaping machine, a Jones and Shipmon high-speed drilling machine, a Brown and Ward light drilling machine, a Holbrook & Sons bench-drilling machine, an Alfred Herbert twist drill grinder, an E. & G. Herbert hacksaw, a Wicksteed mechanical saw as well as the usual tools and a complete set of micrometers, gauges, etc.

The equipment for steam and hydraulics is housed in a building adjacent to the power station, although on a lower level. This building was originally used by the government as a pumping station and has been adapted to its present purposes although it is hoped that at no distant date a new building will be erected for steam and hydraulics. The plant now installed consists of (*a*) two water-tube boilers (one is a Babcock and Wilcox boiler with super-heater); (*b*) a Marshall steam engine with condenser; (*c*) a compound steam launch engine; (*d*) a motor Belliss air compressor; (*e*) a smaller Broom and Wade compressor; (*f*) a Pelton wheel coupled to a 2 K.W. dynamo and also fitted with a water cooled pulley for brake tests; (*g*) a mixed flow turbine of Francis type, fitted with water cooled pulley for brake tests. Two belt-driven centrifugal pumps supply water to it under heads up to 50-ft.; (*h*) a Drysdale centrifugal pump, direct coupled to a D.C. motor, which has been fitted with a brake pulley for preliminary B.H.P. Test; (*i*) "Venturi" meter, fitted to 3-in. pipe capable of recording up to 160 gallons per minute; (*j*) a vertical tank, fitted with gauger glass and carrying on one side a variety of interchangeable orifice plates; (*k*) a large circular tank with central orifice, for showing the form and action of the free spiral vortex; (*l*) a whirling table, driven by a rope

Hongkong University, the Workshop
(In the University workshop the engineering students become familiar with machine tools and workshop practice. The whole of the repair work for the University engineering, medical and other departments and also for the residential quarters is carried out in the workshops)

from the brake pulley of the Pelton wheel, and carrying a glass cylinder in which the form of action of the forced vortex can be studied; (*m*) a set of iron, brass and glass tubes, for experiment on critical velocities and viscons and turbulent flow; (*n*) a Barker's mill with 4 orifices, working under a head of 3-ft; (*o*) an outward-flow reaction turbine of simple form, working under a head of 3-ft.; (*p*) apparatus for experiments on disc friction; (*q*) a mechanical model of a trochoidal wave and (*r*) apparatus for experiment on the impact of jets upon plane and recurved vanes.



Hongkong University, the Steam Engine Laboratory
(Engineering students are here seen testing a small steam engine. This practical work is a feature of their training)

Mention should be made of the fact that, by the courtesy of the public works department of the colony, the engineering students are able to conduct tests on two large triple-expansion pumping engines and cylindrical boilers used at a neighboring government pumping station.

In connection with the prime movers work there are two ice machines one CO^2 and the other NH^3 each of about 300-lb. of ice capacity. These are tested by the students in the usual manner.

There is also a model paper-making plant which causes great interest and was especially designed, built and presented by Messrs. Bertrams, Ltd., of Edinburgh. Paper from rice straw, rags and other materials has been made with this machine.

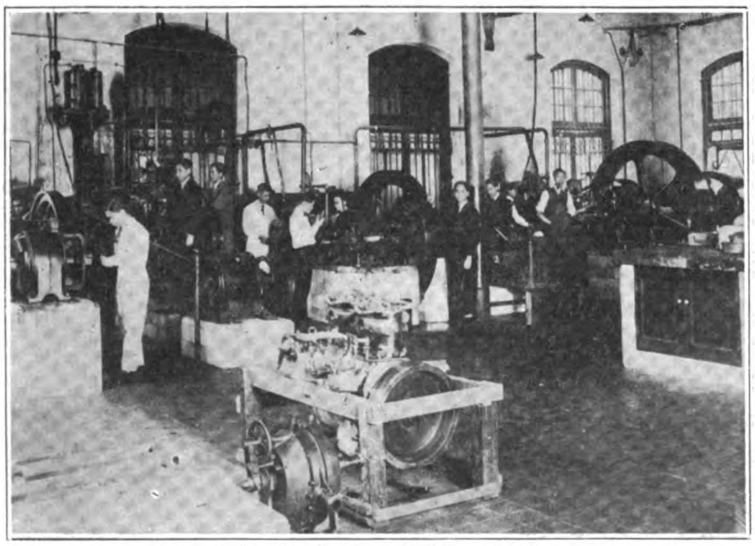
There are a number of models of turbines, engine machine parts in this room containing the paper-making machine.

Adjacent to this room is the junior drawing office where the engineering students of the first and second year receive instruction in geometrical and machine drawing. This is always open and students may often be seen there at work in the evening at their own initiative.

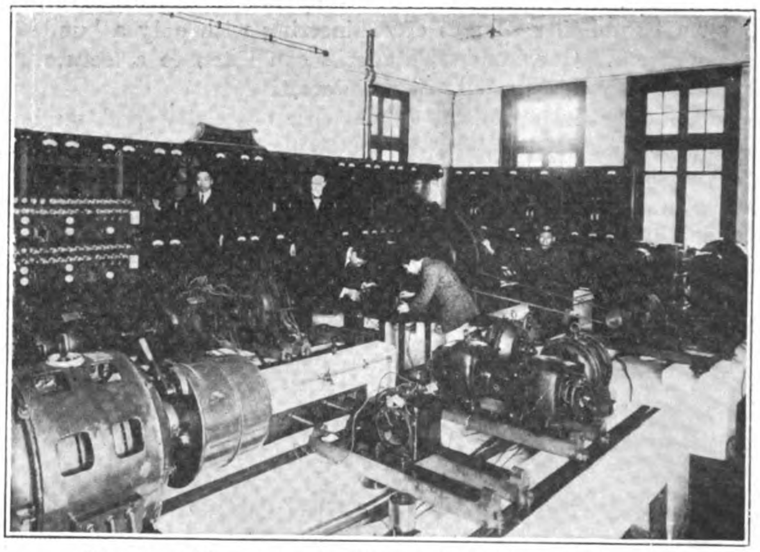
The electrical laboratories consist of (1) electrical machinery laboratory; (2) electrical technical laboratory; (3) photometric room.

The electrical machinery laboratory is adjacent to the power station and occupies a floor space of 41-ft. by 29-ft.

The equipment consists of (1) Vickers Balareer set consisting of two 110 volt 4 pole shunt wound machines of 7 K.W. capacity each; (2) Vickers motor generator set consisting of (*a*) 110 volts 4 poles shunt motor of 13½ H.P.; (*b*) 220 volt three wire generator of 9 K.W. capacity with static balancer; (3) B.T.H. rotary converter with exciter: D.C. Voltage 220, AC 2 or 3-phase at 50 cycles capacity 7 K.W.; (4) E.C.C. D.C. compound generator, 2 poles, 110 volts, 8.5 K.W. capacity; (5) motor generator set consisting of (*a*) 10 H.P. 110 volt, 50-cycle Bruce Peebles 3-phase induction motor coupled to (*b*) Mawdsley 110 volt 2 pole shunt wound D.C. generator of 10 K.W. capacity; (6) motor generator set consisting of (*a*) 10 H.P. 110 volt, 50 cycle Mather and Platt 3-phase induction motor coupled to (*b*) Mather and Platt 110 volt 4 pole shunt wound D.C. generator, fitted with interpoles and of 7 K.W. capacity; (7) a Vicker's shunt motor 110 volts, 5 H.P.; (8) Brush 3-phase 50-cycle induction motor 5 H.P.; (9) Crypto single-phase 75-cycle induction motor 5 H.P.; (10) Mather and Platt 2-phase 50-cycle induction motor; (11) Brook single-phase 50-cycle induction motor 3 H.P.; (12) Crypto single-phase 75-cycle repulsion motor, 3 H.P.; (13) Mawdsley 480 volt D.C. shunt motor 3 H.P.; (14) Mather and Platt booster, 90 amps, 0-50 volts.; (15) Rhodes A.C. motor, repulsion-induction type 1 H.P.; (16) B.T.H. 110 volts shunt motor 1 H.P.; (17) B.T.H. 110 volts series motor 1 H.P.; (18) crypto motor generator set consisting of (*a*) 110 volt 75-cycle single-phase induction motor driving (*b*) 30 volt 10 amp. D. C. generator; (19) static transformers of various ratios and capacities.



Hongkong University, the Power Station
(This laboratory is not only used for testing the various heat engine but heat engine is also the electrical generating station for power supply for the University. Every evening, from about 6 p.m. to 11 p.m., four or five engines are at work and day and night there is always one or more prime movers supplying power)



Hongkong University, the Electrical Machinery Laboratory
(In this laboratory the engineering students make tests on the various direct and alternating current machines)

The machines are connected to a 22 panel experimental switch board, fitted with starters, rheostat, etc., and two pairs of bustars, main and experimental, arranged so that current can be taken from the power station feeders.

The electrical technology laboratory is in the basement of the university and occupies a floor space of 38-ft. by 29-ft. It is equipped for experiments which need comparatively small currents and it is used by the third year engineering students.

In this basement is a full-size tramcar presented by Messrs. Dick, Kerr & Co., Ltd., with motors, controllers, etc., complete.

The rest of the basement—which is airy and well lighted—is devoted to strength of materials and applied mechanics.

The strength of materials laboratory is fully equipped for the scientific investigation of the phenomena of elasticity and for commercial testing of material of construction. The laboratory occupied 2 rooms, the smaller being devoted to the elementary experimental work and to extensometer measurement.

The larger room contains: (1) A 30-ton Buckton testing machine operated by a Vicker's motor. The controller of this motor allows the straining screw to be operated at any speed within the practical limits; (2) an Avery torsion machine, land operated of maximum capacity of 10,000-inch lbs.; (3) a 1,000-lb. Denison wire testing machine.

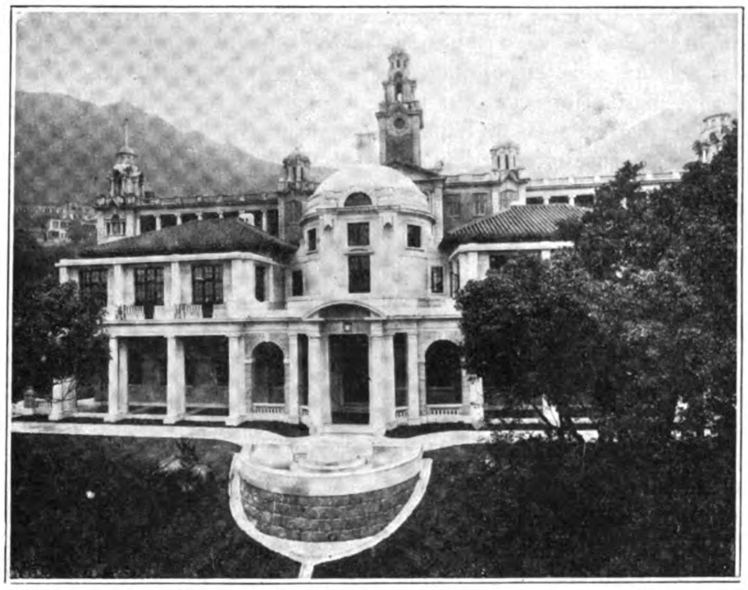
The other machine room contains: (1) A 4-ton Avery testing machine; (2) a Bailey cement tester; (3) an Avery cement tester; (4) a Sankey metal bending tester; (5) an alternating stress machine (torsion); (6) a 1-ton testing machine by the Cambridge Scientific Instrument Co. for use with the Ewing extensometer; (7) a 1-ton testing machine by Messrs. Pye for use with the Granter extensometer; (8) apparatus for the study of the flexure of beams; (9) microphotographic apparatus for study of the structure of material.

The applied mechanics laboratory is well equipped with apparatus for about 20 experiments.

The senior drawing office is on the top floor of the university and is a room of area 40-ft. by 30-ft. It is used by the third and fourth year students.

Mention should be made of the physics and chemistry laboratories which are airy and well equipped. They are used by the first and second year engineers.

A valuable portion of the student's training is the visits to works, which take place at regular intervals.



Hongkong University, Students' Union Buildings

(This building contains reading rooms, a debating hall, billiard room and a refreshment room and is available for all the University students for recreation purposes)

Social Life

There is a most active university engineering society which arranges these visits and meetings at which local engineers, visitors and others give addresses of a technical nature.

The students' union building is probably one of the most beautiful buildings in the Far East. It stands on an area of 122 by 42 and consists mainly of four rooms and an entrance loggies. The four rooms are billiard room, a lounge, and they are all beautifully furnished. Concerts are also held in the great hall and the social life of the students at the university is carefully planned so as to provide them with reasonable recreations.

There is a fair sized athletic ground behind the main building of the university of area 100-ft. by 120-ft. The large recreation ground within about ten minutes of the university is of area sufficient for cricket matches. It is distant about a quarter of a mile from the main building on a most beautiful site.

The importance of a healthy social and athletic life for the student is fully recognized by the university authorities. That is one of the chief reasons for having all the students in residence in the university hostels.

There are five "halls or hostels" in which students live. They are respectively named, Lugard, Eliot, May, Morrison and St. John's Hall, and are all attached to or in the grounds of the university.

The area of the grounds (including buildings) of the university is about 1,000,000, sq. ft. The site is on a hill-side, and varies in level from about 200-ft. above sea level to about 450-ft.

Past Records

It should be explained that, in order that there should be no question as to the standard of the engineering degree, the work of these students has been sent to assessors in London who are examiners of the University of London and these assessors have always certified that the standard reached by the candidates from Hongkong has been equivalent to that required for a corresponding degree of the University of London. The following are engineering graduates who obtained honours degrees in engineering in the university:—

First Class Honours: Fu Ping-sheung (1916); Liu Chen-hua (1918); Chien Hung-van (1919); Sung Zau-yoen (1920); Chun Wing-ching (1920).

Second Class Honours: Tang Ying-lam (1916); Leung Nai-hang (1916); Iu Tak-cheung (1917); Lai Hau-chin (1917); Lee Iu-cheong (1917); John Moraes (1917); Wong Zung-kwei (1918); Wong Zung-yu (1918); Shih Ying-ching (1918); Lim Bang-in (1918); Lee Boon-hock (1918); Cheah Sin-bee (1918); Yao Kwang-yu (1918); Hu Kwok-leung (1919); Chau Iu-nin (1920); Lui Sun-lu (1920); Yang Ssu-chien (1921) and Chiu Kwan-tze (1921).

Concerning the employment of these engineering graduates we understand that as close a record has been kept as is possible. A number have gone abroad in order to obtain further practical experience or in order to do post-graduate work. Some are employed on railways, in engineer's and architect's offices, or in commercial organizations; while others have commenced work on their own account.

Constitution

It should be made quite clear that the University of Hongkong is not a government institution, although the university authorities would be first to acknowledge the sympathy and the assistance with the local government has always extended to it. That has been the consistent policy of the Hongkong government towards education almost from the very beginning of the history of the colony in 1841. The governor, as chancellor, is the official head of the university, but the chief executive officer is the vice-chancellor, who devotes his whole service to the administrative work of the university. Sir Charles Eliot, K.C.M.G., LL.D., at present British ambassador at Tokyo, was the first vice-chancellor, and acted in that capacity for nearly six years. His fame as a scholar is too world-wide to need comment. The present vice-chancellor is Sir William Brunyate, K.C.M.G., a distinguished graduate of the University of Cambridge, and for years legal and financial adviser to the government of Egypt. Sir William is now well known in educational circles in China and last year visited Peking, Hankow, Shanghai, Singapore, Penang and Java in order to consult with those interested in education.

The supreme governing body of the university is the court, consisting of about sixty members, many of whom are Chinese and there are also Parsees. There are a number of local *taipans* and prominent commercial men in the colony and in the Far East, generally have identified themselves with the work and well-being of the university. The executive body is the council, which might almost be called a committee of the court. There is a strong finance committee, including, *ex-officio*, the chief manager of the Hongkong and Shanghai Bank.

In academic matters the senate functions and there are boards of faculties to consider matters of special importance to the particular students concerned such as examinations, etc.

There are at present about 260 students, nearly all in residence. There is no reason why the numbers should not increase considerably in the near future if the schools in China can prepare candidates successfully for the entrance examination. As we have already stated, there is room at the university for 500 or more students and, with no very great extensions, the number might easily exceed 1,000 students.

Enough has been written to show that, during its ten years of active service, the University of Hongkong has justified the most sanguine hopes of its founders and has been of considerable benefit to China. In common with educational institutions all over the world it is always able to extend its activities and increase its efficiency if further funds are available. We are, naturally, particularly interested in the development of the engineering faculty and we commend its needs to those who believe that by the development of her vast natural resources China will take her rightful place in the world.

The Vice-Chancellor and Staff

The University has been fortunate in securing the services of a very distinguished scholar and administrator as vice-chancellor and principal. Sir William Edwin Brunyate, M.A., K.C.M.G., has been in the Far East for rather more than a year and has already made many friends in places as far apart as Peking, Hankow, Shanghai and Penang. Before accepting the appointment as chief executive officer of the University of Hongkong, Sir William Brunyate had made a great reputation as a wise counsellor and able administrator in Egypt.

Sir William Brunyate was born in 1867. His University reputation was made in Cambridge University, England, for he graduated under brilliant circumstances. In 1888, he was second wrangler; in 1889, his name appeared in the first division, first class, second part of mathematical tripos and in 1890 he became famous as Smith's prizeman. During the same year, he was the president of the Cambridge Union Debating Society. From 1890-96, he was a fellow of Trinity College, Cambridge, and he was called to the bar at Lincoln's Inn in 1894. He entered the Egyptian government in 1898 and in that service he obtained many honours and acted both as legal advisor and also financial advisor to the Egyptian government. It may be of interest to record that before going to Egypt, Sir William Brunyate acted as professor of mathematics for a year in one of the Australian Universities while the occupant of the chair was on leave. So that, in returning to academic life, Sir William was really going back to work not altogether strange to him.

The first vice-chancellor of the University of Hongkong was Sir Charles Eliot, K.C.M.G., who is now British Ambassador in Tokyo. Sir Charles Eliot was famous for his remarkable academic and diplomatic career. It has often been stated that he is able to converse fluently in twenty-seven languages.

The officers of the University are as follows:

Chancellor: His Excellency Sir Reginald Stubbs, K.C.M.G.
Vice-Chancellor: Sir William Brunyate, K.C.M.G.
Deans: K. H. Digby, M.B., B.S., F.R.C.S. (Faculty of Medicine)
C. A. Middleton Smith, M.SC., M.I. (Mech.) E. (Faculty of Engineering)
W. Brown, B.SC., M.A. (Faculty of Arts)
Registrar: N. Teesdale Mackintosh, M.A. (Oxon)

Modern Scientific Enterprise

It is a very frequent occurrence to hear of some new scientific discovery. Modern medical science advances every day, and in Europe analytical laboratories have been established in order to use these discoveries for the benefit of mankind. In these laboratories some of the world's cleverest scientists are showing what can be done by a practical application of analytical methods.

China is a far cry from Europe, and it would seem that these modern methods are not for her, but a laboratory, fitted with the most up-to-date instruments and apparatus, has been opened at 16 Canton Road, Shanghai, by a man who has made the thorough study of this branch of medical science, his profession.

More and more of late years, has the medical profession been impressed by the fact that a clinical application of this science is not merely worth while, but necessary in modern medicine, and this laboratory, though principally working for and with the profession, does welcome patients for private diagnosis. It ought thus to be of great service to people in the Far East.

The symptoms of most diseases may be found in liquids, e.g., blood, sputum, urine and also in the feces; tests of the last-named especially being very important. Parasitical diseases flourish in China, and for many of these there are no characteristic symptoms upon which to base a clinical diagnosis. Possibly only after years of treatment for dysentery, gastritis, enteritis, etc., may the realization that it is some other disease, force itself upon the sufferer. These parasitical diseases, though often mild in character, sometimes give rise to grave secondary bacterial affections, of which an early diagnosis is imperative. But some parasitical diseases, such as amœbic dysentery, follow a bacterial disorder, and immediate knowledge of the cause of such disease is necessary, in order that a special treatment may be commenced, as there are many forms of dysentery, each of which needs a different remedy. The analytical tests obviate the possibility of mistakes when determining the nature of these diseases.

Take for instance, malaria; in the sub-acute and chronic forms there are no clinical characteristics. Some symptoms, such as enlargement of the spleen, gastro-intestinal disturbances, anæmia, etc., are also common to non-malarial affections, but when the blood analysis is used there is no likelihood of a mistaken diagnosis.

The blood is the most sensitive liquid known, if a foreign element is present in the body, the blood immediately sets up a counteracting ferment. This theory underlies Professor Abderhalden's reactions, which have been latterly improved upon to such an extent, that an analysis of the blood will show with certainty whether any foreign growth is malignant (cancer) or not. Again, in the case of cancer, it seems highly recommendable to have an analysis made a few weeks after the operation, to prove whether it has been possible to remove all of the malignant body, or whether a particle left has started a new growth. The head of the institute is particularly familiar with these tests, having only returned from working with Professor Abderhalden.

From the foregoing it will be seen that familiarity with analytical chemistry is of great importance to modern scientists, and more especially so in the Far East, where diseases such as have been mentioned, are very prevalent, as the analytical method disposes of the possibilities of mistakes when determining the exact nature of various diseases. The establishment of this Bakteriolog.-Serolog. Institut must therefore be regarded with great satisfaction by public of China.

China's Window-Glass Imports

The curve of China's consumption of window glass indicates a growing demand for the substitution of glass for paper windows. The pre-war year of 1913 marked a 50 per cent. increase in consumption over 1912, and had the war not intervened China's present consumption of window glass would no doubt be much greater.

The Superstructure of the Netherlands India State Railways

By H. L. Slinkers, Chief Engineer at the Construction and Bridge Department of the State Rail and Tramways in Netherlands India

1. *Length and Gauge of Lines in Exploitation.*—According to the law of April 6, 1875, the construction of the state railways in Java was started, for which a normal gauge of 1067 m.m. was chosen. Nearly three years later (May 16, 1878) the first line could be opened for public traffic. This was the line Sourabaya-Pasoeroean of a length of 63 K.M. After this, continuously was worked at the extension of the system, and, at the same time, tramways of narrow gauge (600 m.m.) were laid down. Moreover, some lines, not built by the S.R. were taken over, under more tramlines of 750 m.m. gauge, so that in 1920 there were in exploitation:

Java	Gauge	1067 m.m.	2510 K.M.	
"	"	600 "	119 "	
South Sumatra	"	1067 "	229 "	
West "	"	1067 "	245 "	
North "	"	750 "	515 "	
		Total ..	3618 K.M.	

In this table is not included the line Solo-Djocja (60 K.M.) which line the S.R. has in common use with the N. I. Railway Company. Last named company is owner of this line, and has constructed it in broad gauge (1435 m.m.) For use by the S.R. a third rail has been added.

Railways and tramways in N. I. exist only on the islands of Java, Sumatra and Madura. In Celebes a state-tramway is in course of construction.

The S.R. have principally single track. At the end of 1919 the total length of double, triple and quadruple track only attained a length of nearly 30 K.M.

However, the doubling of the track is being carried out vigorously at the most important line sections. On the following lines the track will be doubled, a greater part of which is now completed:—

Meester-Cornelis-Tjikampek	72 K.M.
Wonokromo-Krian	21 "
Krian-Kertosono	58.5 "
Padalarang-Bandoeng	14.5 "
Total ..	166. K.M.

2. *Subdivision of the System. (a) According to Exploitation.*—The government has fixed three "General Regulations" according to which the railways and tramways in N. I. are managed as primary, secondary railways or as tramways. According to this subdivision there are in exploitation:

Primary Railways Java	1523 K.M.
Secondary " "	752 "
Tramways (1067 m.m.) "	235 "
" (600 m.m.) "	119 "
Secondary railways, W. Sumatra	245 "
Tramways (1067 m.m.), S. Sumatra	229 "
" (750 m.m.), N. Sumatra	515 "
Total ..	3618 K.M.

The loading-gauge, fixed by the General Regulations has the same dimensions for secondary railways and tramways of 1067 m.m. gauge, i.e., max. width 3.20 m., max. height above top of rail 3.85 m. For primary railways and narrow gauge tramways another profile has been determined upon. For the prim. railways the max. width is fixed at 3.70 m., max. height at 3.85 m. For tramways of 600 m.m. gauge: max. width 2.70 m., max. height 3.40 m.

Besides the loading-gauge, the prescribed max. speed is characteristic. This max. speed amounts to:

75 K.M. an hour for prim. R.R.
45 " " " " sec. "
30 " " " " tramways.

These speeds, however, have been increased by different revolutions for particular line-sections, with which the max. speeds given in sub 2*b* are connected.

It is intended to make the trip Weltevreden-Cheribon-Kroja-Soerabaya possible in one day (822 K.M.), so that on the level sections of this line (only 57 K.M. is through mountainous country) a speed of 100 K.M./hour may be attained. Until now this speed has been attained only on trial-runs. For the time being the maximum speed is 75 K.M./hour.

(*b*) *According to Speed and Construction.*—In connection with the greatest allowable speed, the S.R. has divided its normal lines in Java into the following sections:—

Section A^1	level	lines max. speed	100	K.M./hour	—	689 K.M.
" A^2	"	" " "	75	" "	—	404 "
" B^1	mount.	" " "	65	" "	—	57 "
" B^2	level	" " "	60	" "	—	82 "
" B^2	mount.	" " "	50	" "	—	198 "
" C	level	" " "	50	" "	—	321 "
" C	mount.	" " "	45	" "	—	524 "
" D	lines	" "	40	" "	—	235 "
				Total ..		2510 K.M.

By this subdivision the construction of the railroad also is fixed.

3. *Largest Locomotives and Axle-loads.*—The largest and heaviest locomotives of the S. R., which at the same time show the greatest axle-load and cause the greatest rail-stresses are: on the level-lines: the 2—C—1: 4 cylinder compound locomotives with four-axle tender. Total weight 106 tons, max. axle-load 12 tons.

On the mountain-lines: the 1—D—D (2—8—8—0) locomotives with four-axle tender. Total weight 133.46 tons, max. axle-load 11.38 tons.

Fig: 1.

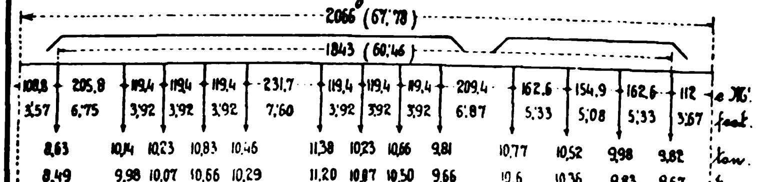
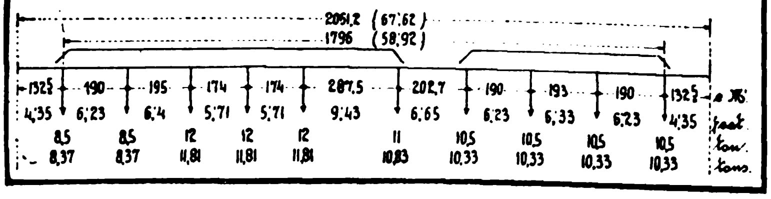


Fig: 2.



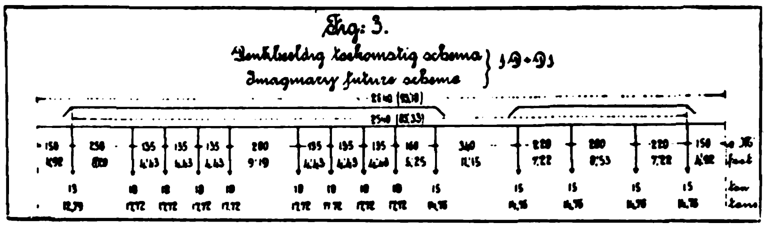


Fig: 3.

Construction of Superstructure

4. *General Remarks.*—Dr. J. A. H. Haarman, chief engineer of the department of construction and bridges of the S. R., has had an important share in the construction of the superstructure. By him, in 1908, the track of 1067 m.m. was submitted to a calculation, the results of which have been compared with the 1435 m.m. gauge, used in Europe.

Two studies were published by him, viz. :

(*a*) " Beschouwingen over den bovenbouw van het spoor met wijdte van 1067 m.m., in het bijzonder van dat der Staatsspoorwegen op Java." Ed. of the Javasche Boekh. en Drukkerji, Batavia 1908.

(*b*) " Raillasschen, Ene aanvulling der berekeningswijze van Dr. H. Zimmermann en een pleidooi voor de lasch met uitkragende steunlaschplaten." Ed. as *a*.

In consequence of the study sub *a*, based on the theory of Zimmermann, the construction of the track with the rail No. 2 (weight 25·75 K.G./M.) as introduced in 1900, was abandoned, as being less suitable, and in 1909 was proceeded to use rail No. 3 (weight 33·4 K.G./M.), with joint-construction and sleeper-space as mentioned in the work of Mr. Haarman and further described sub. 14.

In the study sub *b* quite new views were given about the effect of long fish-plates. The use of long fish-plates not always appears to secure smooth running, and therefore a new system has been recommended, about which more will be said sub. 14.

Now we proceed to more detailed description of the track.

The Rails

5. *Types of Rail of the S.R.*—The following types of rail are used by the S.R. on the through lines :—

Weight K.G./M.	Information	Location	Length K.M.
40.05	Tunnel near S. Loento	West Sumatra	0.8
33.4	Rail No. 3	Java	972.0
27.02	,, 1	Java (Bangil-Malang)	49.0
25.75	,, 2	Java	1418.0
,,	,, 2	S. Sumatra (Lampong line)	77.0
,,	,, 2	W. Sumatra	244.2
,,	,, 2	N. Sumatra (Atjeh)	43.5
			1782.7
25.75 à 29.76	Partly rail No. 2	S. Sumatra (Palembang line)	152.0
25.4	Iron rail	N. Sumatra (Atjeh)	4.5
20.8 à 21.1		Java (Babat-Djombang)	71.0
16.4	Gauge 750 m.m.	N. Sumatra (Atjeh)	467.0
11.2 à 14.88	,, 600 m.m.	Java	119.0
		Total...	3618.0

From this table appears that principally two types of rails are used, i.e., No. 2 and No. 3. In March, 1919, it was determined to use a heavier section of 45 to 46 K.G./M. and to use this type, i.a., on sections, where replacing rail No. 2 by a heavier one will be necessary. Rail No. 2 continues for section railways and tramways.

It still forms a point of consideration, if for the new railsection will be chosen the Prussian profile No. 15 or the Dutch normal profile No. 46. In this question the cost of procuring will give the decision. Last named profile belongs to the series of normal sections projected by a Netherl. rail-commission, and fixed in the assembly of the section for railway construction and exploitation of the institute of (Dutch) engineers held on Oct. 18, 1916. The principal dimensions of both profiles, with those of Nos. 2 and 3, will be found in next table; further the profiles Nos. 2, 3 and NP 46 are represented in Figs. 4, 5 and 6.

Definition	Rail No. 2	Rail No. 3	Prussian No. 15	Dutch NP 46
Weight in K.G./M.	25.75	33.4	45.05	46.23
Height m.m.	110.—	134.—	144.—	142.—
Width of base m.m.	90.—	105.—	110.—	120.—
Width of top m.m.	53.—	58.—	72.—	72.—
Tickness of web m.m.	10.—	11.—	14.—	14.—
Max moment of inertia in c.m.^{4} ...	538.3	1036.6	1582.9	1640.—
Min. moment of inertia in c.m.^{4} ...	88.9	150.7	259.1	310.—
Max. moment of resistance c.m.^{3} ...	97.4	154.0	216.8	231.—
Min. moment of resistance c.m.^{3} ...	19.8	28.7	47.1	51.67

6. *The Elevation of the Outer Rail in Curves.* (*a*) *For the Sections A_2—B_2—C and D.*—This is fixed by the well-known formula:

$$h = \frac{V^2 \ s.}{R. \ g.} \text{ where:}$$

h=elevation in m., s=distance c. t. c. of railtop=nearly the gauge in m.

V=speed in m./sec., R=radius of curve in m., g=accel. of gravitation in m./sec.

However, in view of the slower trains, for V not the max. speed of the section is taken, but a smaller one. By various considerations in connection with the number and speed of trains, for V are taken the speeds of 14—12—10 and 8 M. per sec. for the above-named track-sections. It appears that the elevations thus arrived at, are about half of what should be obtained, when for V had been taken the max. speed of the section.

Elevations less than 0.02 metre are not practised.

b. For the Sections A^1.—In view of the great speed (100 K.M./hr) which on these sections will be applied, another method of calculation has been followed. Departed was from the greatest speed admitted in curves on the European gauge of 1435 m.m. This speed is considered to be allowable on the gauge of 1067 m.m.

R. in Metres	900 and more	800	700	600	500	400	300
Max. speed in K.M./hour	100	95	90	85	80	75	56
Max. speed in M./sec.	27.8	26.4	25.0	23.6	22.3	20.9	18.1

This table is taken from the Eisenbahn-Bau und Betriebs-Ordnung of the German empire, although without increasing the speed to more than 100 K.M.

Putting in the above-mentioned speed for V, the elevation of the outer rail is fixed by the formula :

$$h = \frac{V^2 \ s.}{R. \ g.} = 0{\cdot}03$$

in which formula the letters have the meaning already mentioned. The line of thought has been the following :—

Taking into account the slow trains, the amount should be fixed with which the theoretical elevation, necessary for the max. speed, should be diminished. From tests taken by Bräuning* it appeared that the theoretically necessary elevation may be diminished or increased by 1/50 to 1/20 of the gauge, without causing trouble to passengers.

* See Handbuch der Ingenieurs. Wissenschaften," page 139, second Edition, 5th part, 1st vol.

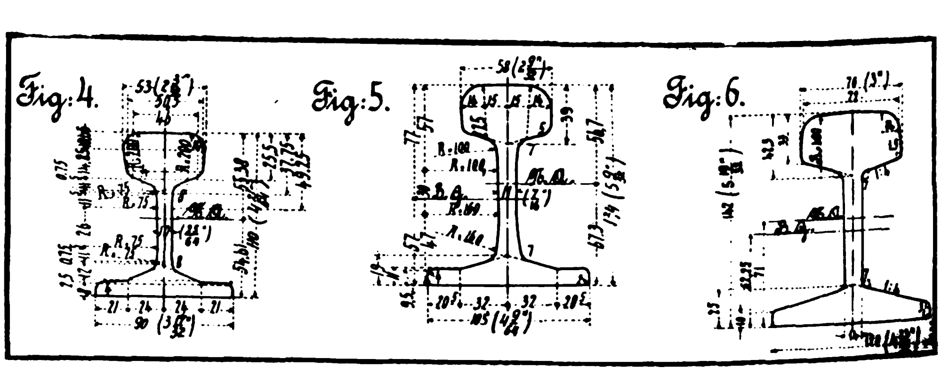


Fig: 4. Fig: 5. Fig: 6.

This is equivalent to 1067/50 to 1067/20 or nearly 0·02 to 0·05 m. An average of 0·03 was then chosen. Thus, after rounding off to 5 m.m. the next table was got at, wherein for R=2000 and 3000 m. also the smallest elevation of 20 m.m. was applied.

R in Metres	3000	2000	1500	1200	1000	900	800	700	600	500	400	300
Elev. h in m.m.	20	20	25	40	55	60	65	65	70	80	90	908

c. *For the Sections* B^1.—For the sections B^1 the same elevations are used in curves of the same radius as calculated for A^1.

7. *The Transition-curves.*—The transition-curves have the shape of the generally used cubic parabola, according to the formula

$$y = \frac{x^3}{\text{constant}}$$

For the sections A^2—B^2—C and D the constant has for all curves the following values respectively 76824—56442—39196 and 16742 :—

For the sections A^1 the constant=6000 Rh.
" " " B^1 " " =3600 Rh.

8. *The Increase of Gauge in Curves.*—The increase of gauge in curves of 150—200—250—300 and 400 m. radius respectively amounts to 20—15—10—5 and 5 m.m. In curves of 500 m. radius and more, no increase is applied.

9. *Rails on Bridges and Open Water-passages.*—On the bridges the largest distance between sleepers is not more than the max. distance admitted on the section.

At the transition to the bridge, care is taken to decrease the sleeper-distance of the last three sleepers on the abutment to 60 c.m., and is the distance between the last sleeper on the abutment and the first one on the bridge as small as possible (max. 70 c.m.)

At open water-passages, the width of the passage is 70 c.m., so that the distance of the supporting points is larger than the distance of the sleepers on the roadbed. Therefore the rail often is reinforced by a longitudinal wooden sleeper.

10. *Testing Requirements of the Rails.*—The material of the rails is ingot-steel with a tensile strength of 60-70 K.G./m.m^2, and an elongation of resp. 11.5 to 14 per cent. Rails of chrom-nickel steel are not yet in use.

The chemical composition must satisfy the following conditions: Carbon at the utmost 0.55 per cent. sulphur max. 0.06 per cent., and phosphor max. 0.10 per cent.

Further the rail has to satisfy to falling tests, etc., about which nothing more will be said.

11. *Distortion of Rails. (a) By Temperature-variations.*—The change in length is made possible by the clearance between the ends of the rails. This clearance, when not directly exposed to the heat of the sun, should amount to 5—6—7— and 7 m.m. respectively for the normal length of 6·80—10·20—11·90—13·60 metres. The nuts of the fish-bolts are fastened with a washer of a specially fixed length, so as to avoid too intense fastening, and to secure a free expansion in the joint.

The loosening of the nuts is prevented by safety-appliances i.a. by using spring washers between nut and fish-plate, or by using the so-called large nuts, which are not secured (see Fig. 12). These large nuts at the underside are turned concave, so that only the circumference bears on the fish-plate. In this manner a great moment of friction prevents loosening.

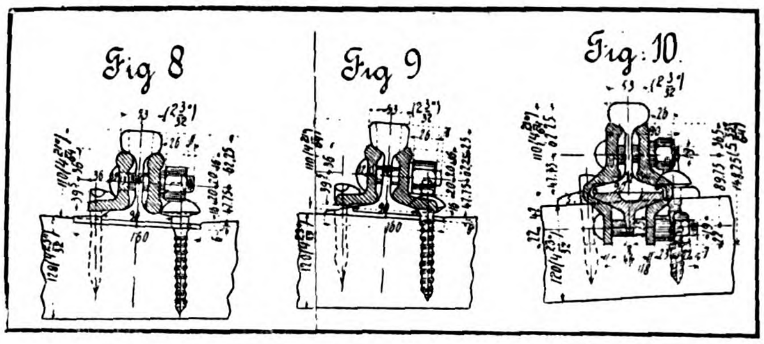
b. *By Wear of the Rails.*—Rails that are used up to a loss in weight of 12 per cent., or to an extent, that in curves, the wheels touch the fish-plates of the outer rail, are replaced.

c. *By Over-loading.*—On some sections, f.i. on the line Poerwakarta-Padalarang, where the rail No. 2 is heavily loaded (see sub 12) were observed alternately bright and dark spots. Originally it was thought this was caused by the well-known undulating wear of the rails.

However, after some measurements, it soon became clear that these phenomena was to be explained by over-loading, to which the rails in question were subjected. The rails show a wave-like surface, caused by permanent distortion. The lower points occur nearly in the middle between two sleepers, the higher ones not quite above the sleepers, but somewhat besides of these. The observations on this question are still being continued.

The Joints of the Rails

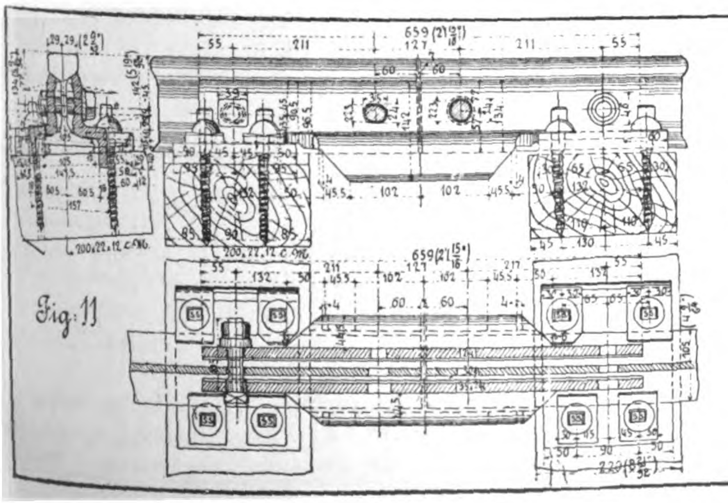
14. *Description of the Different Models.*—The different types are to be distinguished according to the year of prescription.

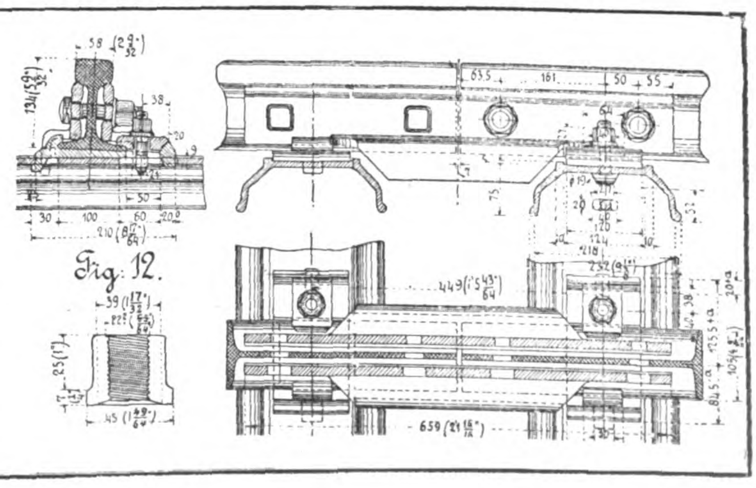


Model 1875 (see Fig. 8). The original construction exists of a flat inner- and an angle-formed outer fish-plate. When the traffic increased, the joint construction was found to be too weak, there aroused deflections in the track the so-called cat-backs.

Model 1895 (see Fig. 9). When in 1895 reinforcing the permanent way was thought to be urgent, and the length of the rails was changed from 6.80 to 10.20 metres the joints also were made more solid. For the inner fish-plate also was used an angle-formed one.

Model 1900 (see Fig. 10). Both angle-fish-plates were replaced by wing-fish-plates. Between these two fish-plates, under the foot





of the rail, is fitted a T-piece, jammed by long coupling bolts between the fish-plates. In this manner it was supposed both the head and the foot of the rail-ends should be rigidly fixed, so that the profile of the rail was united as complete as possible. In practice, however, it became clear that the T-piece does not join the bottom of the rail. It, the T-piece, shifts when under charge. Further the tightening up of the bolts under the railfoot has the consequence, that the fish-plates above the railfoot give away to the outside, so that the rail-heads are less sufficiently joined. The wing-fish-plates also have a too complicated shape, so that the true moment of inertia will appear to be much smaller than the theoretical one.

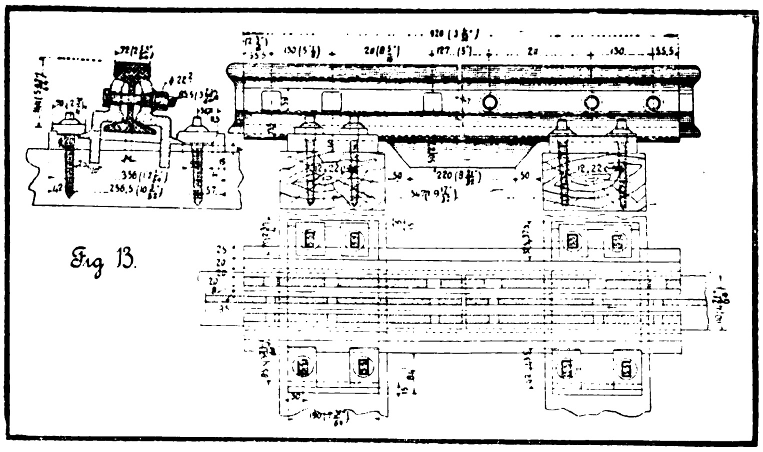
Finally it was observed that the fish-plates cracked at the point where the reinforcing commenced. The passing over from one profile into the other is too sudden.

The joint is still in use, however, without the T-piece and the coupling bolts at the underside.

Model 1909 and 1910 (see Figs. 11 and 12). In 1909 came into use the heavier rail No. 3. A new construction of the superstructure was projected. Model 1909 is used with wooden sleepers, model 1910 with iron ones.

The fish-plates have a much simpler shape. Although in Europe already long fish-plates with 6 bolts were in use, this was not imitated by the designer, Dr. J. A. H. Haarman, for reasons he gave in his work, mentioned sub 4a. Long fish-plates have the disadvantage of causing jumping of the not-loaded rail-end, on which detail will be said more (see sub " Model 1915 ").

Model 1911. In 1911 also for rail No. 2 a better joint was designed. The fish-plates have the same shape as model 1909. These fish-plates are already ordered, but not yet in use, because the still existing stock of older constructions is still so abundant, that it was resolved to use up these first. In the meantime in 1919 a new joint was designed for rail No. 2, with the same type of fish-plate as model 1915 (see hereunder).



Model 1915. This model projected for rail No. 3, is of the same type as model 1919, represented by Fig. 13 for the Prussian profile No. 15.

About model 1915 some details are already given sub 4.

The joint construction 1915, system Dr. Haarman (named by him " the joint with flanged-out fish-plates "), is the result of theoretical considerations, dealt with in his work, referred to sub 4b.

Model 1919 (see Fig. 13). The same joint-construction as model 1915 is applicated on rail No. 2 and on the new rail-profile of 45 to 46 K.G./M.

15. *Material of Fish-plates.*—The material is ingot-iron of a tensile strength of 40 to 50 K.G./m.M², whilst the product of tensile strength and elongation at the least must amount to 900. Thus the elongation amounts to a minimum of 25 to 18 per cent.

The Sole-plates

16. *Description of Different Models.—From 1875-1889* few sole-plates were used, or not at all. The inclining position of the rail was obtained by adding the sleeper. *From 1889-1900* flat sole-plates were used, 6 m.m. thick, and fixed by dogspikes. With the sole-plates, the sleepers still must be added under the sole-plates.

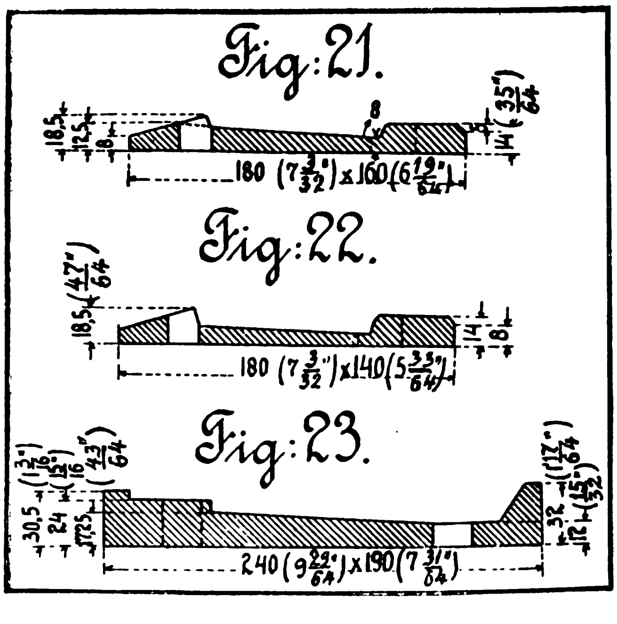
The sole-plates now were applied as follows :

(*a*) On the straight line and in curves of more than 400 metre radius, only on the sleepers at the joints.

(*b*) In curves of 300-400 metre radius moreover a sole-plate was put on the middle sleeper under the outer rail.

(*c*) In curves of a radius of less than 300 metre, a sole-plate is used alternately on the sleepers, but also only under the outer rail.

From 1900 until now, for rail No. 2 are used the models 1900 (see Figs. 21 and 22). From 1900 to 1909 for rail No. 2 the sole-plates were applied alternately, since 1909 on all the sleepers.



The minimum thickness of 6 m.m. is increased to 9 m.m. The sole-plates on the joint sleepers are 18 c.m. long, 16 c.m. wide (Fig. 21) and are fixed by two railscrews at the inside and two dog-spikes at the outside. These plates are also used on the sections A, B and C under the outer rail of curves of 400 metre radius or less.

On the other sleepers the plates are 18 c.m. long, 14 c.m. broad (Fig. 22) and are fixed by a railscrew at the inside and two dog-spikes at the outside.

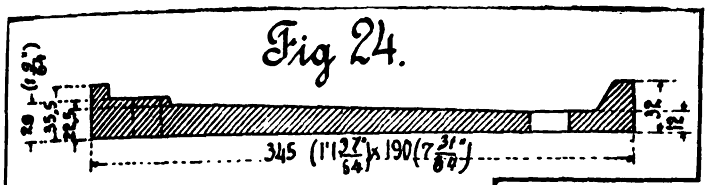
From 1909 until now, for rail No. 3 on wooden sleepers is used model 1909 (Figs. 23 and 25) and model 1915, and on iron sleepers model 1910. About these models the following is to be said :—

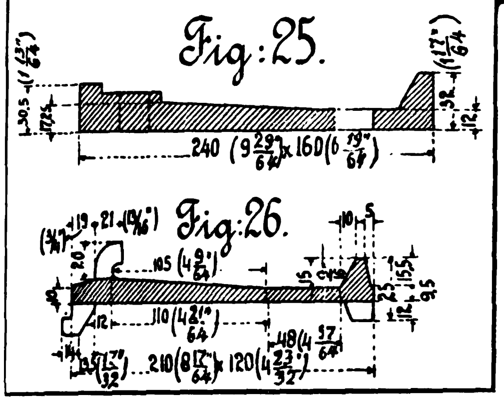
Model 1909 (Figs. 23 and 25). When in 1909 a new superstructure was constructed for rail No. 3, of course a heavier sole-plate was also necessary. The sole-plates were then used on all the sleepers.

On the joint sleepers are used plates of a length of 24 c.m., 19 c.m. wide (Fig. 23) with holes for railscrews ; on the other sleepers the plates are 24 c.m. long, 16 c.m. wide (Fig. 25) with three holes for railscrews.

Model 1910 (on iron sleepers, Fig. 26). These sole-plates are 21 c.m. long, 12 c.m. wide with a hook at the outside and a hole for a holding-down bolt at the inside.

Model 1915 (system Haarman, Fig. 24). On the sleepers at the joints are used plates, 34.5 c.m. long, 19 c.m. wide, with four holes for railscrews. On the remaining sleepers plates acc. to Fig. 25.





The Sleepers

17. *Material and Dimensions.*—Used as material are: Djaty-wood, iron-wood, hard kinds of wild-wood, red deal and ingot-iron. By preference are used djaty-wood(teak) and iron-wood. Sleepers of red deal are not bought any more, because notwithstanding the use of preservatives, they must be replaced after some two years of service. The normal dimensions of wooden sleepers are: length 2 metre, width 22 c.m., height 12 c.m. Originally, from 1875 to 1900, the length was two metres. In 1900 this was increased to 2.20 m., which length in 1909 again was reduced to 2 m., whilst the number of sleepers per rail-length was increased. Dr. Haarman demonstrated in 1909, that in connection with the stresses, caused in the sleepers, the most economical length for the gauge of 1067 m.m. is 2 metres. It is a better method to decrease the pressure on the ballast by increasing the number of sleepers, than by increasing their length. On bridges the normal dimensions are: length 1.80 m., width 22 c.m., height 18 c.m. The iron sleepers also have a length of 2 m. For the other dimensions see Fig. 12.

18. *The Distribution Under the Rails.*—The distribution under the rails is taken as follows:

From the rail-end the first sleeper lays at a distance of 22 to 27 c.m. The remaining sleepers are distributed regularly under the remaining length of the rail. The greatest sleeper-distance, centre to centre, amounts to: *Under rail No. 2*: On the mainlines on straight track 81 c.m. and in curves of R< 400 m.: 70 c.m. *Under rail No. 3*: On the mainline in the straight track and in all the curves 72 c.m. for wooden, and 73 c.m. for iron sleepers.

It is intended to take the maximum distance between 60 and 65 c.m. for sleepers under the type of rail of circa 45 K.G./M. not yet used for the heaviest loaded tracks.

19. *Switches and Crossings.*—About switches and crossings of the S. R. nothing peculiar can be said. The switches are of the well-known construction, with pivoted, or with spring points.

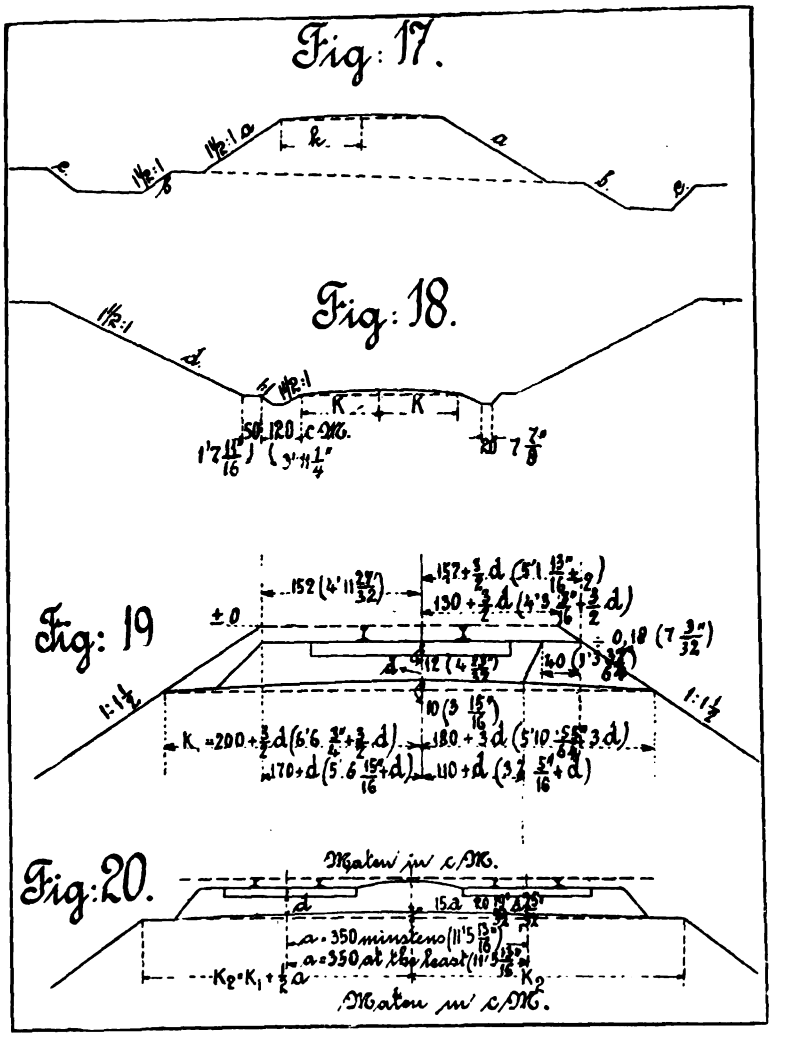
20. *Turntables.*—The largest turntable in use by the S.R. has a diameter of 20 metre. These turntables do not differ much from the well-known constructions. About the turntable of 20 m. it is worth mentioning that it is suspended by means of a pair of heavy wedges, which makes it possible to regulate correctly the height of the table. The turntables nowadays are too heavily loaded, sometimes with 50 to 100 per cent. more than they are calculated for originally. As a fact the turntables of 20 m. diameter also have become too small for the 1—D—D—O locomotives (although these are well turned thereon) a new turntable of a diameter of 27 to 30 m. is in course of construction. Probably this will be moved electrically. In Fig. 3 is given a scheme of the heaviest type of locomotive, for which the turntable is calculated. The S.R. considers the possibility that a similar type in future will run on their lines.

The Formation and the Ballast-bed

21. *The Formation.*—The profiles of the formation are given in Figs. 17 and 18.

It is observed with Fig. 17, that the slopes of the taluds depend upon the kind of ground. The slope of b=that of a; the slope c may be steeper. The measure k is fixed according to Figs. 19 or 20.

22. *The Ballast-bed* (see Figs. 19 and 20).—The thickness *d* of the ballast-bed amounts to 0.35 m. at the sections A. B and C, when there is a good sub-soil, with particularly good sub-soil

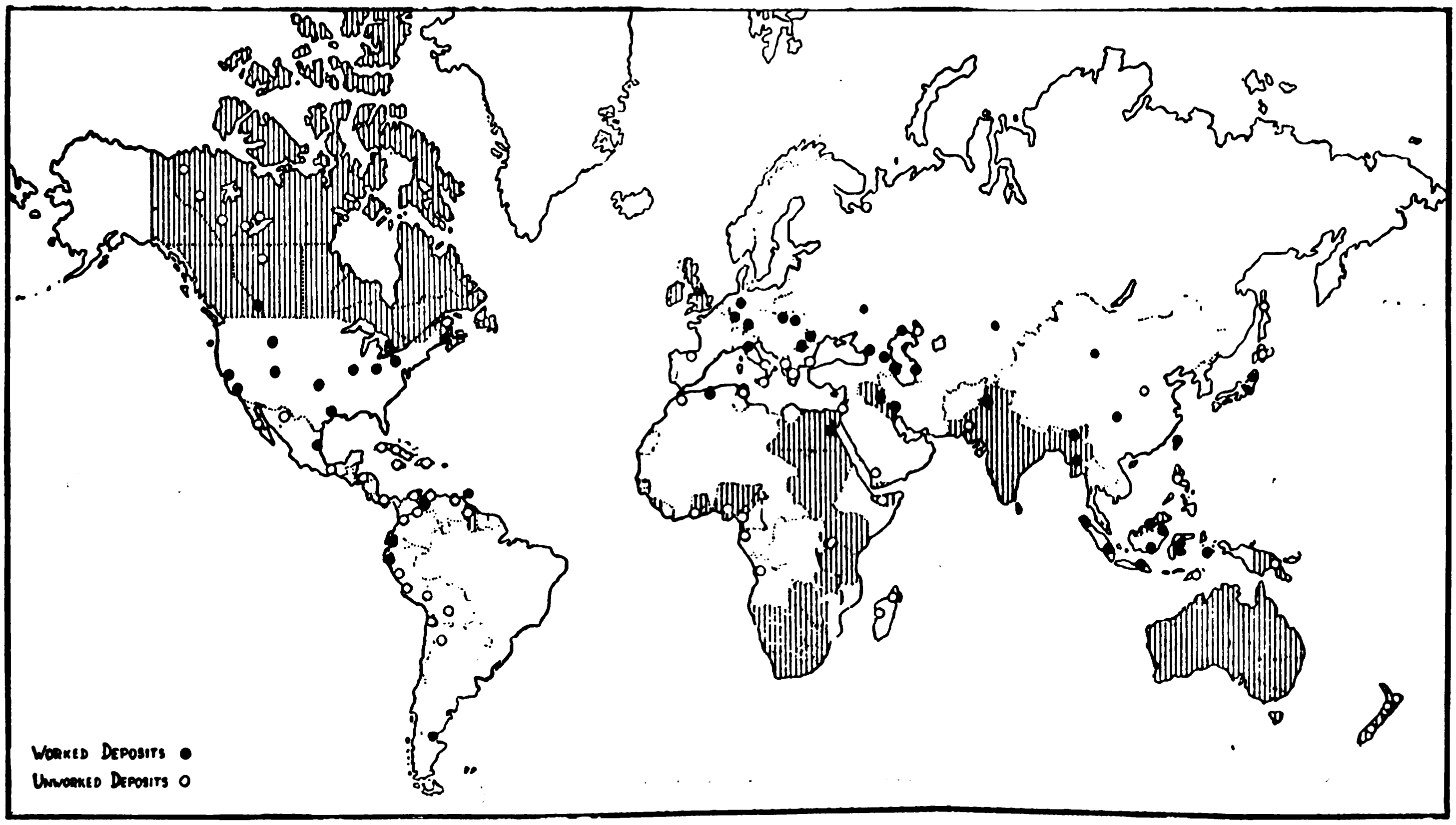


0.25 m. For sections D respectively 0.25 and 0.20 m., sometimes even less until 0.10 m.

For ballast broken stone, gravel and sand is used. Broken stone and gravel, when of a hard quality, give the best ballast-bed

A Valveless Gearless Engine

Any user of internal combustion engines will need no strong argument for the advantage of doing away, if possible, with valves and gears, both of which are a fruitful source of operating difficulties. The idea of an engine without valves or gear has been realized in Great Britain by the construction of an engine which, in the works at least, has given remarkably promising results. This engine has three cylinders; and except for the parts it has no valves. There is not a single gear wheel and all the usual cams, shafts, tappets and springs and even the timing gear are cut out. The only moving parts are the crank shafts, pistons and connecting rods. The experimental engine was rated at ten horse-power and on test developed twice as much. The cycle of operations is not easily described without a detailed diagram but it must be said to depend upon ingenious inter-working between the three cylinders. This engine has been specially designed to meet the conditions in overseas countries, where an extremely simple engine not requiring difficult repairs is for obvious reasons in great demand.



World Map showing Principal Petroleum-bearing Localities referred to in the Monograph
(British Empire shaded)

Petroleum in Eastern Asia

China

IN China are two well-recognized oil-yielding provinces, Shensi and Szechuan, the most important district being in East Central Szechuan, west of Tze-liu-ching, about 100 miles west of Chungking and south of Chintu. About 18 miles south of Tze-liu-ching there is also a heavy seepage, and gas is constantly emitted from crevices in the rocks. There are about 50 wells in operation in this province, the majority of which are in the Tze-liu-ching district. The production of the province amounts to about 30,000 barrels a year.

The production of oil in China has hitherto been entirely incidental to the salt industry, in which it is used as fuel. The wells have been stated to yield from 15 to 50 per cent. of oil, and from 50 to 85 per cent. of brine, the average proportion being about 33 per cent. oil and 66 per cent. brine. The crude oil so far produced burns with a clear flame and is a good illuminant.

The geological formations in China as they have been reported, follow :

Tertiary sandstone, yellow.
Limestone, grey.
Sandstone, red.
Oolite, orange-colored, with petroleum at 600 feet.
Limestone, yellowish, with gas at 300 feet.
Marl, bluish grey, iridescent, white Permian chalk with brine 12 to 15 per cent. at 1,000-1,800 feet.
Schists, greenish, strong brine and flow of gas at 2,500-3,300 feet.

Imports of oil mainly consist of kerosene from the United States and the Dutch East Indies.

There is tank storage at both Hongkong and Shanghai, principally for fuel oil for bunkering purposes.

Dutch East Indies

The islands of Borneo, Sumatra and Java, rank amongst the most important known sources of petroleum, and indications of oil in commercial quantities have also been found in the Celebes and Ceram islands.

The principal producing areas are : (a) in Dutch Borneo, the Koetei and Tarakan areas on the east coast, covering about 500 sq. miles ; (b) in Sumatra, Langkat in the east, Perlak in Atchin residency, and Palembang in the south ; and (c) in Java, Semarang, Rembang and Soerabaya provinces in the north-east.

The oil-bearing strata are of Tertiary age, and generally associated with coal and lignite.

Borneo crude oil from Koetei has been found to contain an exceptionally high proportion of aromatic hydrocarbons, and is therefore valuable as a source of high explosive material, particularly toluol. Tarakan petroleum is a natural fuel oil, while Sumatra produces an oil very rich in petrol.

In the Koetei district of Dutch Borneo, the oil occurs mainly in Miocene sandstones, along anticlines with steeply-dipping sides, and is associated with heavy gas-pressure. The shallow sands in the Koetei fields yield heavy oil of 0·970 specific gravity, with paraffin. The lighter oils from deeper sources are poor in paraffin, and possess a specific gravity varying between 0·860 and 0·890.

The specific gravity of the Langkat oil of North Sumatra is given as from 0·771 to 0·857. In South Sumatra, the specific gravity of the oil from Meliamoen is from 0·765 to 0·775, of that from Kampong Minjak, 0·792, and of that of the oil from Babat, 0·812 to 0·889.

In Java, the chief petroliferous horizon occurs at the junction of the Upper and Middle Miocene ; the wells are quite shallow, varying in depth from 500 to 800 feet, and require pumping. The oil has a specific gravity of from 0·825 to 0·916, and is of asphaltic base, yet yields paraffin wax of high melting-point.

Production (in metric tons) for the period 1905-1920 has been as follows:

—	Dutch Borneo.	Java.	Sumatra.	Ceram.	Total.
1905	439,487	110,711	513,630	—	1,063,828
1906	387,455	111,378	602,501	—	1,101,334
1907	489,151	142,983	713,841	—	1,345,975
1908	511,049	137,013	738,588	—	1,386,650
1909	411,506	140,351	922,894	—	1,474,751
1910	633,472	142,503	719,740	—	1,495,715
1911	814,707	172,438	683,523	—	1,670,668
1912	671,662	184,989	621,481	—	1,478,132
1913	797,059	207,135	529,947	82	1,534,223
1914	866,718	226,590	475,423	487	1,569,218
1915	893,896	256,838	491,611	1,100	1,643,445
1916	957,395	243,442	526,080	3,263	1,730,180
1917	869,123	232,636	583,384	2,248	1,687,391
1918	999,174	225,879	478,068	3,554	1,706,675
1919	1,372.006	235,814	477,977	7,120	2,092,917
1920	1,455,128	311,677	496,351	20,980	2,284,136

Japan and Formosa

Japan.—The belt of oil-producing territory extends along the west side of North Japan, from the west coast of Sakhalin Island on the north, along the coast of the Sea of Japan, through the west side of the central mountain range of Hokkaido, thence stretching across the provinces of Mutsu, Ugo, Uzen, Echigo and Shinano, to the Pacific coast of Totomi in the south. The principal producing districts are Akita in the province of Ugo and Niigata in the province of Echigo. The producing sandstones are of Tertiary age, interstratified with beds of slate or shale, and most of the production is obtained from shallow wells less than 700 feet in depth.

Drilling first took place in Echigo in 1890, when the Nippon Oil Co. successfully brought in a well in the Amaze field, and the development of other districts rapidly followed. The first gusher was brought in at Kurokawa, in the Akita district, in 1914, with an initial production of 10,000 barrels a day. Several others have since been obtained, and in 1916 a new field was proved along an anticline in the Urayama district, parallel with a similar fold in the Kurokawa field. The output has, however, gradually declined, that of 1918 being 101,728 tons less than that of 1915.

The total production for the years 1901-1920 has been as follows:

Year.	Tons.	Year.	Tons.	Year.	Tons.
1901	159,527	1908	294,549	1915	442,793
1902	172,023	1909	268,913	1916	425,415
1903	172,853	1910	246,748	1917	411,768
1904	202,782	1911	248,231	1918	342,814
1905	210,400	1912	236,659	1919	285,000
1906	243,682	1913	274,844	1920	280,000
1907	284,886	1914	388,810		

Formosa.—Indications of petroleum, which have been discovered in Formosa in about 300 localities, occur in 26 oil belts extending for at least 400 miles along the west coast. The Byoritsn and Tabanti fields in the north have already been proved, and the Nairo and Kosempo fields in Ako district, the Senschuiryo field in Tainancho, and the Rokiyukei field in Kagicho are all being exploited.

Distillation of an average sample of the oil gave the following results:—

Specific gravity of crude oil	0.8284
Motor spirit (under 150° C.)	10%
Kerosene (150°-300° C.)	80%
Heavy oil (paraffin and residue)	10%

The production since 1906 has been been as follows:

Year.	Tons.	Year.	Tons.
1906	713	1913	2,586
1907	1,090	1914	2,387
1908	1,186	1915	2,702
1909	919	1916	2,753
1910	520	1917	2,791
1911	234	1918	1,926
1912	493		

Philippine Islands

Petroleum occurs as a very light paraffin-base oil, at various points in the Philippine Islands, notably in the Bondoc Peninsula, at Toledo and Algeria in the island of Cebu, and at Tayabas and Luzon. Indications are also reported to occur on the islands of Palawan, Leyte and Mindanao, whilst the islands of Panay, Guimaras, Negros and Bohol appear worthy of further investigations.

Bondoc Peninsula.—American interests recently sent out a geological expedition, and, as a result of favorable reports of petroleum indications, are actively sinking test wells.

Cebu Island.—In 1914 a company was reported as formed for exploiting the petroliferous areas of Toledo.

Sakhalin (Russian)

For a distance of nearly 200 miles and in a belt 6 to 12 miles wide along the Pacific coast of the northern half of Sakhalin, oil indications have been reported in the Tertiary sandstones. Asphalt is found in all stages of density, from the consistency of tar up to a hard, smooth-surfaced mass resembling an asphalt floor. The lake near Oha Creek, over 1,000 feet long, 400 feet wide, and from 2 to 6 feet deep, is estimated to contain more than 25,000 tons of a tough asphalt-like substance comparatively free from foreign matter. Little development work has so far been done.

Syria

Large deposits of asphalt are reported to exist in the neighborhood of Latakia, near the villages of Kferie, Cassab, Ghoman, Chmeisse, Khorbe and Sonlas; also at Hasbeya, on the Upper Jordan, Sahmur and Ain-et-Tineh, on the Nahr Latini, and another Ain-et-Tineh near Magluda.

In Northern Syria a petroleum spring has been reported to the south-east of Alexandretta.

Timor (Portuguese)

Indications of oil have been found in the eastern half of the island of Timor, belonging to Portugal, where limestone is found coated with asphalt and ozokerite, yielding 24 per cent. of crude oil, and pools of black viscous oil are found on the surface.

There are many natural difficulties to be overcome, but it is thought that oil may exist in quantity at a depth of from 1,200 to 1,500 feet in a Triassic formation, and investigations are to be made with a view to a practical test later, if the conditions are favorable. Unfortunately, the geological formations are much disturbed by earthquake action. Many prospectors of various nationalities have visited Timor, but have abandoned their concessions.

One sample of oil from Timor, of specific gravity 0·840, gave a flash-point (Abel close test) of 112°. Another sample yielded 64.6 per cent. of kerosene and about 30 per cent. of intermediate lubricating oils.

Indicating and Recording Locomotive Speeds

Much of the improvement of the locomotive which has been achieved recently is due to the very accurate measurement of performance. Some years ago a British firm brought out an indicator which shows and records the speed of a locomotive by drawing curves on a time basis. A demand arose for an instrument giving records on a distance basis; and the same company has now produced an instrument for that purpose. One great advantage of records on a distance basis is that the exact speed on every gradient and curve or bridge can be at once ascertained. Thus an efficient check is kept on the driver, who is under obligation to reduce speed on certain parts of the line. Although the instrument is much too complicated for a short description it is so robust and so well designed that only three parts require lubricating more frequently than is needed for ordinary enclosed clock mechanism.

Silver in Eastern Asia

China

IN Chili and North Shansi (North China) silver is obtained from deposits of argentiferous galena. At Tenyung-shang, in the Jehol district of Mongolia, a vein occurs in limestone near the contact with metamorphic schists. It is worked by the Chinese. The vein strikes E.-W. and dips N. 50°-70°. The galena carries 300 to 500 oz. of silver per ton, and blende, also present, 12 to 18 oz. per ton. In the Qusantzu mines, seven miles east of the last, galena with tetrahedrite carries 100 oz. of silver per ton, and occurs in a vein with the same strike and dip and in a similar formation.

In Szechuan (one of the south-western provinces) the Maha gold mine is said to carry a considerable amount of silver. At Lokutetye are veins bearing free gold and lead ores high in silver (300 oz. per ton). At Matasa is a vein of silver-lead, which is said to produce 122 oz. per ton, and another vein bears argentite. At Tachienlu are the government silver mines producing 75 to 90 oz. of silver per ton. The vein is 4-ft. wide and is worked along its strike for over 10 miles. This vein contains complex ore carrying copper, silver and lead, but it is only worked for its silver content. Near Yershe are veins of gold, silver and copper ore, and in the south-eastern district are veins carrying silver-lead.

At Fukea are numerous veins containing copper and silver ore. These mines supplied the greater part of the silver used in the Tang dynasty. Near Huilechao are numerous veins of gold, copper and silver ores, which are worked extensively by the aborigines. In the Yenyuan district are veins carrying gold, silver, lead, copper, zinc and also mercury.

In the Hunan province, Central China, is the Shuikoshan zinc and lead mine. The country is limestone (probably carboniferous) overlaid by red sandstones and shales of cretaceous or tertiary age. Large irregular-shaped bodies of ore, composed of blende and galena with pyrite and chalcopyrite, are developed in the limestone at and near its contact with syenite. The latter has small crystals of chalcopyrite disseminated through it. The deposit was the direct result of the metasomatic action of the mineral-bearing solutions emanating from the magma. Lead concentrate contains from 9 to 38 oz., and zinc concentrate from 2.5 to 15 oz. of silver per ton. The only other deposit with an important output is that of Kungshan in Tungchwan (Yunnan province), where the principal ores are carbonates. The production from the Weihungchow district, Kweichow, is chiefly silver.

The amount of silver produced in China in 1914 was insignificant, and probably did not exceed 50,000 oz.

For 1917 the production is given as 63,900 oz., and that of 1918 as 70,000 oz. (U.S. Bureau of the Mint).

Dutch East Indies

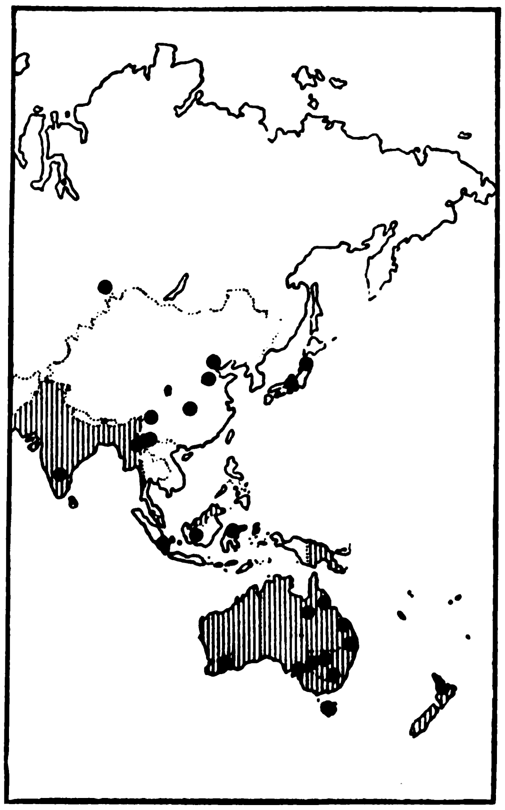
Borneo.—A vein near Budok, Dutch Borneo, contains sylvanite (a telluride of gold and silver).

In the Kahajang mine, of the central auriferous district of Dutch Borneo, there is some silver in the ore.

Celebes.—The sulphide gold ores at Palehleh, on the north coast, contain 12 oz. of silver per ton.

Sumatra.—In the Redjang-Lebong lodes the ratio of silver to gold in the bullion is often as high as 10 to 1. In 1906 and 1907, the mine produced 248,240 and 327,584 oz. of silver respectively.

In Western Sumatra, from Tjalang to a point on the coast opposite the island of Poolo Raja, garnet and wollastonite lenses occur in ancient schist, which carry copper (as bornite), gold, silver and some platinum--silver being by far the chief product.



Map showing the Silver-producing Districts referred to in Text
(British Empire shaded)

Japan

Silver-mining in Japan dates from a very early period, the oldest records referring to the discovery of silver ore in the island of Tsushima, in the year A.D. 674. From then until the year 1896 many deposits were opened up, but during the course of the next few years a number of these had to be abandoned on account of the fall in the price of silver.

The production of the metal gradually increased from 1874 to 1895, but from 1895 to 1904 remained nearly stationary, in spite of the rapid progress made by the gold and copper industries. In 1905 there was a considerable increase in the production owing to the conspicuous development of the Kosaka mine and the general increase of the silver production in the gold and copper mines. The great increase in 1908 was due to the development of the Tsubaki mine, and the total output for that year was more than 17 times the output in 1875, and 2½ times that in 1900. Generally speaking, the production of silver extracted from silver ores proper is declining, but the total output is maintained or increased by the increasing amounts of the metal obtained as a by-product in the treatment of gold and copper ores.

Production of Silver in Japan, 1880 *to* 1919

Year.	Troy Oz.	Year.	Troy Oz.
1880	332,406	1915	5,120,293
1890	1,699,029	1916	5,805,700
1900	1,890,716	1917	7,111,700
1910	4,581,613	1918	6,600,400
1913	4,649,910	1919	5,163,068
1914	4,836,228		

(U.S. Bureau of Mint.)

Production of Silver by the Principal Japanese Mines in 1919

Mine.	Locality.	Troy Oz.	Mine.	Locality.	Troy Oz.
Hitachi	... Ibaraki	1,355,857	Sado	... Niigata	171,252
Saganoseki	... Oita	902,029	Ikuno	... Hyogo	171,146
Ashio...	... Tochigi	581,304	Yoshioka	... Okayama	132,637
Kosaka	... Akita	559,991	Abeshiro	... Aomori	132,616
Kamioka	... Gifu	222,796	Other mines...	—	752,660
Mitsui-kushikino	Kagoshima	180,780	Total		5,163,068

The production of the twenty most important mines during the five years prior to 1908 aggregated 85.2 per cent. of the total output. The greater part of the silver produced by these mines came from argentiferous lead ore; 18.6 per cent. from normal or dry silver ore, and 15.7 per cent. from argentiferous copper ore. It is to be noted, however, that there is a tendency for the output of silver from copper ores to surpass that derived from dry silver ore.

The silver deposits, whether in the form of veins, impregnations, or metasomatic replacements, are practically confined to tertiary volcanic flows of liparite and andesite and tuffs of the same age. On the other hand, the economically unimportant contact-metamorphic deposits are restricted to the region occupied by pre-tertiary rocks.

Several of the principal mines exploit dry silver ore as well as argentiferous lead and copper ores, which occur as lodes traversing eruptive and sedimentary rocks of tertiary age. Of considerably less importance are argentiferous lead and copper ores which occur as impregnations in tertiary rocks. With regard to deposits of the metasomatic type it is stated that, although great numbers of such deposits exist, the only one actually explored is the so-called Kuroko deposit. The Kuroko deposit was worked in conjunction with the Tsubaki mine, which in 1908 yielded the greatest output of silver of any mine in Japan.

Numbers of deposits of the contact-metamorphic type are known, but only a few are important, such as those at Kamioka and Hiragane in Hida. These occurrences are very commonly situated at or near the contact between igneous intrusions and Palæozoic or pre-Cambrian strata.

The Tsubaki mine, opened in 1889, no longer produces. The country rock consists of tertiary shales and andesites. The ore is the so-called "kuromono" or "black ore," a mixture of argentite, blende, galena, pyrites, chalcopyrite, barytes, quartz and calcite. It contains generally 0.07 per cent. of silver, but the richer parts yield 0.15 per cent. to 0.3 per cent of the metal. The Kosaka mine was opened in 1866, and is one of the most important in Japan. The ore is of the kuromono type and yields copper, silver and gold, and occurs as a large mass in tertiary tuff near its contact with dacite. The Ikuno mines are said to have been started in 807, although it was not until 1542 that they were worked on anything like a large scale. There are two principal mines, namely, the Tasei and the Kanagase, which yield copper, silver and gold. The country consists of tertiary tuffs, liparite and associated rocks, and the ore is made up of argentite, native gold and silver, with chalcopyrite, pyrite, galena, blende, pyrargyrite, stibnite, quartz, calcite and rhodochrosite. These minerals occur in a series of veins. The Kamioka deposit is said to have been discovered about 1,200 years ago, and yields silver, copper and lead. The rocks are hornblende gneiss with limestone and intrusive quartz-porphyry, and the deposits, which consist of argentiferous galena, chalcopyrite, blende, actinolite, epidote, with calcite, quartz, pyrite, etc., occur as lodes.

Siberia

The silver-lead mines of Western Altai, government of Tomsk, were important in the early part of the nineteenth century. In Central Altai the deposits lie for the most part in carboniferous limestone and occur as lodes carrying silver-bearing lead ores mixed with a large proportion of barytes. Silver tellurides are also mentioned as occurring in these deposits. The mines have been worked out to depths of 700-ft., and operations did not apparently pay in depth. The deposits in the Salair mountains are very similar in their mineral contents, as likewise are those in the Kolybane district, but are stated to be much richer. The Zmeeff mine near Kolyban Lake, south of Barmaoul, exploited a particularly rich shoot of ore. Another rich group of mines is the Rydirsk group.

In 1845 the silver production of the Altai is given as 26,331 oz. and in 1891 as 313,462 oz.

Oil in the Philippines

By H. Edmund Bullis

WITH the tremendous increase in the world consumption of oil, the finding of petroleum in the Philippines is of tremendous importance. The experts from the bureau of science have for many years been investigating the possibilities of petroleum in the Philippines, and have located petroleum-bearing shales and oil seepages in several provinces, notably in the Bondoc peninsula, Tayabas province, Luzon, Leyte and in Mindanao.

The first real attempt to obtain oil in the Philippines was in 1896, when an English company started drilling on the Smith-Bell estate near Toledo, Cebu. This company had obtained the services of an experienced Pennsylvania oil driller and when their well was down about twelve hundred feet, they were surprised by insurrectos and forced to abandon their work.

Because of the enormous expense and the uncertainty of oil drilling operations, no real attempts have been made since that time until last year, when the Richmond Petroleum Company, a subsidiary of the Standard Oil Company of California, actually started operations on the Bondoc peninsula.

This company has been working for about eighteen months, preparing the way for the drilling work on the Bondoc peninsula. At the present time this company has leased approximately 36,000 hectares in this locality and during the past year the government has been pushing the cadastral survey in order to establish beyond doubt the ownership of the land which the Richmond Petroleum Company has leased. Due to the present uncertainty of ownership of a part of the land in this tract, it has been necessary in many instances to make contracts with different claimants to the property until the results of the survey have been made known and claims passed upon before the cadastral court.

Drilling for oil in the Philippines is certainly not a poor man's game, since it costs from two to three times as much to drill here as it does in California. The Richmond Petroleum Company has brought over approximately $200,000 worth of equipment and has twenty-four Americans actively engaged in the drilling operations. One thousand tons of machinery and supplies were landed upon the beach near the drilling site from the United States shipping board vessel *West Cahoot* in three and a half days, by lighters of the Atlantic, Gulf and Pacific Company. By means of a Holt tractor with two trailers, this material was transported to the camp, which is now adequately equipped with electric lights, an ice plant and a wireless station.

This company's first attempt at drilling was on a lease in the vicinity of the Amuguis river, three to three and half miles north of the southern extremity of Bondoc peninsula. The first drilling site is located on the south end of a low, broad dome or doubly plunging anticline. There are no natural indications of oil such as seepages or asphalt within this anticlinal area, but at Bacau, two miles north of the northern end, there is an excellent showing of very light oil near the Canguinsa river. The shale, when placed

in water, yields a very thin sheet of oil which spreads very rapidly. There are several test wells at Banco, four miles northeast of the drilling site. A poor showing of oil shale occurs at Sili, about four miles northwest of the drilling site.

The drilling of the first well was with a rotary outfit for deep well drilling, and a seventeen inch hole was carried to a depth of 1,065 feet. At three hundred and fifty feet, in a fine grained sandstone, a fair showing of oil and gas was encountered. The thin, light oil spread over the mud, which came from the bottom of the hole as a return fluid from the rotating fish tail of rotary. A better showing was reported at five hundred and fifty feet, and this stratum has continued to yield combustible gas bubbling through the thick mud. While these indications are encouraging, they do not demonstrate an economic source.

At the depth mentioned above (1,065 feet), the hole caved in and it was necessary to put in 12½ inch casings. The operation was then continued to a depth of 1,323 feet, when caving troubles became so serious that drilling of the first well had to be stopped about the middle of May.

A new site has been selected about two miles from the first drilling site and a new attempt is being made. While this failure of the first well to produce is discouraging, it is only one of the trials connected with oil well drilling. The new well will be cased as it is drilled, which process, of course, will take much longer than the rotary drill process, but will prevent the caving in which occurred in the first well.

The Vigo group, the strata in which oil seeps frequently occur, is widespread throughout the Philippine Islands, and in many places, such as Mindanao, Cebu and Leyte, its shales are petroleum bearing. One and a half miles east of the barrio of Baliti, on the northwest coast of the island of Leyte, there is an indication that in *times past* there existed an economic source of petroleum. This exposure is in a fault block, and asphalt prospectors have developed in its north end a very excellent surface for study. This stratum is from fifty to seventy-five feet in thickness, and from visible outcrops appears to be about six hundred feet in width and six hundred feet in length. How much greater in extent it may be is unknown.

The rock composing this outcrop is a mixture of porous ash and pumice, which was laid down in the quiet waters of the Vigo sea. Numerous small animals have also contributed their limestone skeletal material to this rock. Later, this portion of the sea bottom was lifted, folded and its pores were thoroughly impregnated with petroleum. still later, faulting took place and the petroleum reservoir was cracked, while lighter portions of the petroleum evaporated, leaving in the twenty-five per cent. voids of the rock a thick, tarry, bituminous residue.

If the Richmond Petroleum Company succeeds in drilling into loose sandstone or tuff similar to this Leyte occurrence, it is quite possible that an economic deposit will be developed in the south end of the Bondoc peninsula.

If oil is found in commercial quantities, it cannot be determined at the present time whether or not refineries would be built on the field, or elsewhere in the islands, or whether the crude oil would be sent to other parts of the world for refining. At the present time, the only refineries in the Orient are the Dutch Shell Refineries in Borneo and Sumatra. If gas should be found in sufficient quantities with the oil, it might pay to build a refinery right in the field and the various by-products could be shipped from the refinery to the places of distribution. On the other hand, if little gas is found, and if the quantity of oil obtainable warrants, pipe lines could, undoubtedly be built to the ocean, where oil tanks could be erected as storage stations while waiting for the crude oil to be loaded on ships.

The importation of petroleum products into the Philippines is becoming a more important factor every year. The table published below gives some idea of the rapid growth of the use of petroleum products in the islands.

This table does not include the large amount of petroleum products used in the navy. It can be seen from these figures that if we could produce enough petroleum products in the Philippine Islands to satisfy our needs only, it would be an economic saving of nearly twenty millions of pesos per year. If extensive oil fields were found, we might have enough petroleum products to export to other places in the Orient.

The Richmond Petroleum Company is taking a great risk in this hazardous venture to prospect a practically virgin field for petroleum, and it is the hope of the American chamber of commerce that it will succeed in its undertaking.

Importation of Petroleum Products into the Philippine Islands (Bureau of Customs)

	1920 P.	1919 P.	1918 P.	1917 P.
Crude Oil	2,010,224	352,439	138,407	55,759
Naphthas, including all lighter products of distillation ..	7,666,168	4,795,364	1,106,229	1,672,755
Illuminating Oils ..	7,715,706	6,677,590	2,426,920	2,673,335
Lubricating Oils ..	1,248,260	1,251,405	796,718	538,615
Totals	18,640,358	13,076,798	4,468,274	4,940,464

Progress in the Field

To date there are sixteen petroleum companies which have made application for, or have been granted, leases in the Philippines. Of these only one is operating and two are exploring. The only operating company, the Richmond Petroleum Company of California, according to its third and latest quarterly report, had reached a depth of somewhat more than 300 metres in its first well on lease tract Amuguis No. 1, Bondoc peninsula, Tayabas province, Luzon, when caving in the hole became so bad that it had to be abandoned. A "show" of oil and gas was obtained at about 100 metres depth, but not in economic quantity. It was then decided to move the rig about 3 kilometres farther north to a point higher on the structure where it is expected that drilling will be resumed in October.

This company has a very complete equipment of up-to-date well drilling machinery, both standard and rotary machines, twenty-four American drillers and mechanics, and a large force of natives. The entire plant is very complete. In addition to erecting several buildings, the Company has had to build roads in virgin country. It has an ice plant, a necessity in this country, and also enjoys radio connections with Manila. Besides the operating force on Bondoc peninsula, this company maintains a central office in Manila and three field parties are engaged in geological investigations in various parts of the archipelago.

The public can get some idea of the methods of a large oil company, when it learns that a geologist of this company was on the ground for a year and a half before drilling was commenced, and this after the government had already done a great deal of preliminary exploratory work, which work was available to the company.

Copra in New Guinea

A little known source of copra is being developed in the former German possessions in New Guinea. The German owners of the plantations were allowed to continue operating them during the war, but as they were not permitted to send their profits out of the country, these were employed in clearing the jungle and in making extensive new plantations, which will be coming into bearing at different times during the next four or five years. It is expected that the existing production of copra will increase from the former 18,000 tons to at least 28,000 tons. It has been decided not to permit the importation of laborers from other countries, but to rely upon the native Papuans and Malaysians, who make fairly good cultivators. The former German laws relating to indentured labor have been abrogated and liberal regulations introduced under which there are now 30,000 laborers on the plantations in place of the 17,000 in 1914.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, APRIL, 1922.

"The Policy of 'The Far Eastern Review'"

By Its Publisher

THE Treaty is ratified. The attitude of THE FAR EASTERN REVIEW has been justified by events. It is now possible to be more explicit in explaining an editorial *volte-face* which caused considerable comment in Far Eastern and American journalistic circles.

With the ratification of the treaty, comes a book entitled "An American Diplomat in China," which strengthens the position of THE FAR EASTERN REVIEW by a public confession of the exact nature and object of a campaign, which, in its inception in 1915, compelled me to retire from active journalistic work in China because I could not conscientiously support American policy as then interpreted by the last American minister to China. When, at the peace conference in Paris, followed by the campaign for war with Japan, it became clear that the nation was being railroaded into a dangerous position by Minister Reinsch and his co-workers, I determined that the time had arrived for the initiation of a counter-campaign that would bring about a solution of Far Eastern problems along more rational lines.

To do this I have had to present Japan's side of the case. I hold no illusions about Japan or her militarists, I hold no illusions about China, or her militarists. Notwithstanding my great sympathy for the latter country, it would never bear stretching to the point where I could advocate hostilities between America and Japan or demand a "show down" that the American people would not support. My sympathy has been with the Chinese people, and I have never swered from my original ideas except where it became essential to present Japan's side of the controversy so that Americans would have all the facts before them. My fight has been conducted against the activities of those Americans, who, like Minister Reinsch, induced the Chinese officials to believe that the United States would fight Japan single-handed in order to redress their real or fancied wrongs. I was told on my arrival in China nearly two years ago, that "I could not size up a situation." I couldn't, when it came to supporting the agitation against Japan, then at its height. I could, however, size up the situation in America. I knew something the agitators and sentimentalists overlooked. I knew the American people. I knew that the real red-blooded American would never go to war with Japan over China. I knew that Americans would never go to war with Japan without some initial aggressive move on her part. I knew that when it came to a "show down" the manhood of America would never accept quietly being hustled on transports to cross the Pacific to fight Japan, unless they were well satisfied that the safcty of their own country was endangered. If, as I was assured time and again, by leaders of the rabid anti-Japanese movement," the United States must fight Japan; that war was inevitable; that now was the time, before she become stronger; then, there was every humanitarian and patriotic reason why all sides of the case should be aired. Never again will the people of the world be plunged into the horrors of war without a full knowledge of all sides of the facts, I knew, personally, of secret moves that had been made during the war by overzealous and mentally-warped Americans, in their endeavor to curry favor with China by attacking Japan. I also was well informed that in many small and petty ways the Japanese had well earned the ill-will of Americans, British and Chinese, and that an international association in North China was preparing an indictment of their activities during the war, but these deeds, to my mind, could never be stretched into a good reason why America, single-handed, should challenge Japan. I sensed that those most active in yelling for war with Japan would be most conspicuous by their absence from the fighting forces if hostilities were declared.

There was every good patriotic reason to fight such a propaganda, and when the attempt was made in March, 1920, to penalize this publication for its attitude, and every underhand, disreputable and questionable method employed to "put THE FAR EASTERN REVIEW out of business," I accepted the challenge. We have won. I can now express myself more freely and invite attention to the book by Dr. Paul S. Reinsch, entitled "An American Diplomat in China," published by Doubleday Page & Co., the first copies of which have just arrived in the Orient.

The title is a misnomer. A perusal of the book will reveal that far from being a diplomat in the strict sense of the word, Dr. Reinsch was the Poo Bah of Peking, the Shogun of China, the power behind the presidental chair, with a finger in every pie, consulted at all times by all manner and classes of Chinese from the president down the line through the cabinet, tuchuns, politicians and even unto the school children. However, that is a separate story. We simply desire at this point to invite attention to the closing chapter of the book and to Dr. Reinsch's letter to President Wilson tendering his resignation as American minister to China.

On page 382, Dr. Reinsch informs us that his resignation was tendered in the hope of enabling him to develop closer relations more effectively between China and the United States. "*I wished to bring about positive practical, action.* The spirit of the American policies and declarations was admirable, but not enough individual and specific American activity in China accompanied them." Now what was this positive practical action so much desired? In his letter of resignation dated June 7, 1919, after a violent indictment of Japan, he says "Since the complete breakdown of Germany the case of Japan has been carried through solely on bluff though perhaps it may be that the Japanese militarists have succeeded in convincing themselves that their establishment is formidable. *But it is plain that they would be absolutely powerless in the face of a stoppage of commerce and a navy demonstration on the part of any one of the great powers. No one desires to think of this contingency, but it is plain that after the breakdown of Germany it was not feasible for Japan to use force nor could she have suffered a greater damage than to exclude herself from the peace conference where she had everything to gain and nothing to lose. In ten years there may be a very different situation. Then also our people, having grown wise, will be sure to shout; 'Why was not this stopped while there was yet time?'*"

The story is outlined in the above undiplomatic words. Dr. Reinsch was advising the president to call Japan's bluff through a naval demonstration and a stoppage of commerce, which, for all practical purposes, amounts to a declaration of hostilities, and he sounds the keynote that has been repeated to me by all his co-workers. "*Now is the time;* now, before Japan grows stronger"; and if the president in his wisdom should fail to heed the warning, Dr. Reinsch tells him that in ten years, the nation will demand to know why it was not done sooner!

Dr. Reinsch was a quick worker. He was not so sure about the naval demonstration and hurried home to help along the cause of Armageddon. Although there is no direct proof that Dr. Reinsch advised the Chinese to boycott Japanese goods he did not advise against it, and there is proof that as soon as he placed foot in the United States, he urged in a press interview that Americans should hurry to China to skim off the cream of the Chinese trade while the boycott was on.

With the confessions of Dr. Reinsch before us it is not difficult to understand who was the master mind of the agitation to precip-

itate hostilities between Japan and America and it is easy to understand why, with this high example before them, the secretaries of American chambers of commerce in China, the Millard coterie, and others all worked in close unison with their chief. Never before in the history of such (movements) did such close team work prevail. From the time that Mr. Thomas F. Millard hurriedly departed from Paris in May, 1919, "to break the treaty in the senate," the anti-Japanese war-party lost no effort to precipitate hostilities, disguised under the thinly veiled hope that Japan was bluffing, that she would not fight. They refused to listen to any other method of settling these Oriental problems. America had the money and the guns; they wanted the latter pointed at Japan while we told her what to do in China and Siberia. In every way they brought pressure to bear on congress to intensify a situation they had been instrumental in creating. When Millard was solemnly warning the senate committee on foreign relations that the Shantung award at Paris meant war, quoting Mr. E. T. Williams, the chief Far Eastern adviser to the American delegation at Paris, Mr. J. B. Powell, his colleague, editor of *Millard's Review*, acting in his capacity as secretary of the American chamber of commerce in Shanghai was flooding the United States with circular letters calling upon firms interested in China to write to their congressmen and senators to demand from the state department the secret correspondence and memorandum that would disclose Japan's discrimination against American trade in Shantung and elsewhere, and have these documents read into the congressional records. An open incitement to hostilities. At the same time, the secretary of the American chamber of commerce at Tientsin was also sending out similar circular letters in which it was stated that only through armed intervention could China's sovereignty be preserved. Another open invitation for armed assistance to China. Nearly all of these so-called secret reports had been written during the war and there must have been a very close and intimate co-operation for their contents to be so widely known. It was a difficult situation, one that might well have led to most serious consequences, had not other far-sighted, conservative Americans got together to oppose the movement. There was every reason to believe that the war group with the reins of the situation in their hands would stop at nothing to hold their advantage.

We have no desire at present to reveal the depths of the underhand campaign employed by our political opponents to damage the prestige of this publication by the circulation of false reports, sufficient to say, however, that most of the proofs of the conspiracy is in our hands, the evidence all pointing conclusively to a tacit understanding that THE FAR EASTERN REVIEW was to be "put out of business." Chief amongst these reports was one that "The FAR EASTERN REVIEW had sold out to Japan," that it had received large sums to conduct Japanese propaganda, etc. These reports, from proof in our possession, emanated from the same sources that had previously circulated the story that THE FAR EASTERN REVIEW had been sold to the British, part of a deliberate attempt to destroy its usefulness amongst American manufacturers for the benefit of a competing magazine published in Shanghai, and edited by an American who acted as secretary to the American chamber of commerce. This, however, is a separate story, which will be brought before the American chamber of commerce at the proper time and place.

The policy of THE FAR EASTERN REVIEW has been aggressively American, reflecting the views of the most important interests in the United States as opposed to those Americans in China who insist that their opinions must be accepted as the basis of American policy in this part of the world. The views of the big business men in America were shared by their colleagues in Japan who stood opposed to the military policies of their own government and desired an honorable solution to existing problems so both nations could co-operate harmoniously for the reconstruction of China.

Both sides felt that the agitation for a "show down" could only end in hostilities, in which the greatest sufferer would be China. They held that only through frank conversation and exchange of views could a mutual understanding be arrived at. There were certain limitations that had to kept in mind. Japan would tolerate no interference with her rights in Manchuria gained as the result of two wars. She was willing to sacrifice all other advantages in China, but here she stood firm. There were angles to this situation that had to be explained so that Japan's case could be made clear. We have tried to place these facts before our readers, so that, in the event of a "show down," Americans would understand the other side of the case. The Washington conference was convened for the sole purpose of solving these problems, and it is gratifying to this publication to see that its policy all along the line had been fully vindicated.

We were the first paper in the Far East to point the necessity of a four-power pact to supersede the Anglo-Japanese alliance, and the first to call for a Pacific conference so that China's *full* case could be presented. The campaign of THE FAR EASTERN REVIEW for a better understanding through mutual concessions has been terminated. Our policy from now on is to contribute as far as possible to the reconstruction of China through international co-operation. We do not advocate that American firms in China should hand their business over to Japanese, but we do believe that China will be benefitted by a more friendly co-operation between American and Japanese capitalists, the first step in which is the success of the consortium, or, in the event of its dissolution, some other understanding that will permit the two nations to co-operate in China without friction.

Foreign Armed Forces in China

THE powers recently concluded a conference at Washington, in which, amongst other things, steps were initiated for the purpose of restoring, as soon as practicable, China's sovereignty, and to this end, all foreign troops are to be recalled. Yet as soon as it becomes evident that this decree is to be carried out the American chamber of commerce at Tientsin vigorously opposes the withdrawal of American troops from North China. "In view of the uncertainty of the political and military situation in China and the activities of large numbers of bandits," the chamber declares that the "withdrawal of the American troops at Tientsin would endanger the lives and property of Americans in China."

Now, if the property and lives of Americans in North China are endangered, the properties and lives of Americans in Shanghai, Hankow and other southern and Yangtze river ports are equally in danger. If there is a likelihood that the forces of Chang Tso-lin and Wu Pei-fu may come to grips in North China, the same possibility menaces Hankow as the forces of Sun Yat-sen move northwards and those of Wu Pei-fu attempt to check them. If Sun Yat-sen should make a diversion and send his troops down the river valley to Nanchang, with Nanking and the control of the Shanghai-Nanking and the Tientsin-Pukow railways as his objective, the lives and properties of Americans in Shanghai, Nanking and other ports will be endangered. There is just as much of an eventuality that internal disorders will break out in Central China as in the north, and American interests in the Yangtze should be equally as well protected. So, if the presence of an American regiment is essential to the peace of mind and security of Americans in Tientsin, two more regiments are necessary to insure equal tranquility amongst Americans in the Yangtze valley, to say nothing of Canton and South China.

American and foreign troops are in Tientsin in accordance with the terms of the Boxer Indemnity treaties, *for the sole purpose of keeping open the railway from Peking to the sea*. They are not there, as we understand it, to guarantee the lives and properties of American citizens in North China against the depredations of bandits or the dangers incidental to domestic strife. If the precedent established in 1900 for the sole protection of the legations is now to be extended to cover the uncertainties of internal politics and protect foreigners against the possible consequences of domestic warfare, then the principle must in all equity cover other parts of China where Americans have as much at stake as those residing in Tientsin.

The attitude of Americans in Tientsin is adequate proof of the hollowness and speciousness of past denunciations of Japan for maintaining troops in China for the protection of her nationals. Japan has a force stationed in Hankow, for what specific motive, we have never been able to fathom, but there is ample reason to believe they are there for the protection of Japanese merchants, their families and their properties, in which, it may be taken for granted, that their equity in the great Han Yeh Ping Steel Works is a vital consideration. The Japanese stationed troops in Shantung and in Chientao, they have entered Siberia and North Manchuria for the avowed purpose of insuring adequate protection to their nationals against the operations of bandits and other armed forces; they have gone further, and through the medium of the twenty-one demands extracted from China the privilege of establishing police boxes in various parts of Manchuria for the protection of the lives and properties of Japanese subjects against the depredations of the Hunghutzes.

Every such move has called forth the bitter denunciation of other foreigners. The American chamber of commerce of Tientsin, through its secretary, was responsible for a lengthy circular letter to firms at home which emphasized that, because of the presence of Japanese troops in Shantung, foreign armed assistance alone could restore the province to China. The shoe is now on the other foot. The American government has solemnly pledged itself to the full restoration of China's sovereignty, and to withdraw its troops as one of the first proofs of its sincerity, yet as soon as it appears that such a desirable example is to be set for other nations to follow, American residents in Tientsin are the first to protest.

We do not wish to be misunderstood. We believe there exists ample justification for the fears expressed by the American chamber of commerce of Tientsin. But it is equally true that the same menace confronts Americans in Hankow and the Yangtze valley ports, who have as much right to demand a regiment for their protection as Americans in the north. American troops are in Tientsin for the specific object of keeping open the railway from Peking to the sea. If they are to be retained there indefinitely for the protection of American lives and properties because of the uncertainty of the political and military situation and the activities of large number of bandits, the precedent is created for dispatching further American and other forces to other parts of China. The uncertainty of the political and military situation and bandit activities are chronic symptoms of the Chinese situation. If it is not Chang Tso-lin against Wu Pei-fu or Sun Yat-sen against the field, one tuchun or another in some other part of China is on the rampage. No section of China has been free from these disturbances for the past decade, and from all appearances, they have become normal and will continue so for some time to come. Let us then be honest with ourselves, with the other powers and with China. The plea of the American chamber of commerce of Tientsin, if acted upon by the American government, creates a principle that must be extended for the protection of Americans and other foreigners in other parts of China. The protest against the withdrawal of the American regiment at Tientsin is a frank admission that Japan has been justified, when, in the past, she has stationed troops in China to protect the lives and properties of her subjects. It would appear reasonable to believe that if foreign troops are still required to carry out the Boxer treaty provisions for safeguarding the railway from Peking to the sea, an aeroplane squal at Tientsin, would be just as efficient as an entire regiment. A few "crates of eggs" kept in cold storage to be judiciously dropped where they will do the most good at any time the line is menaced by contending forces, would prove more economical and persuasive in keeping it open, than a regiment of infantry acting as railway police. It would be difficult for the Chinese to repeat the mistakes of 1900. The installation of radio plants and the use of aircraft are an assurance against a repetition of the Manchu folly.

The powers at Washington have expressed their faith and hope in China and it is now up to her leaders to bring order out of chaos and demonstrate that they are worthy of the confidence reposed in them. The retention of an American regiment in China under the conditions set forth by the Tientsin chamber of commerce is not only provocative and a menace of further intervention, but a direct indorsement of policies that Americans have been the first to denounce.

China is entitled to every assistance in the difficult task of reorganization and unification that confronts her. The continued presence of foreign troops in North China is a standing invitation to ultimate intervention in her affairs, an obstacle to a proper solution of the admittedly uncertain political situation and an influence that can be utilized to advance or defeat the interests of opposing political factions. Whether Chang Tso-lin, Wu Pei-fu, Tuen Chi-jui, Sun Yat-sen, or any other factional leader gains the ascendency and controls the Peking-Mukden railway should be a matter of supreme indifference to other nations. It is China's railway, and whether it remains open to traffic or not should be equally indifferent to foreign governments. If the uncertainties of the internal political situation, the danger of civil warfare and the depredations of bandits threatens the uninterrupted operation of the line between Peking and the sea, the most sensible thing for the legations to do is to move to Tientsin or some other safe place. The only justification for the continuance of a large foreign force to insure uninterrupted communication between Peking and the sea would be in a recrudescence of the Boxer spirit and a possible seige of the legations. If we admit that this is impossible, then the continued presence of foreign armed forces in North China is an aggression upon the rights of China. The internal condition of China to-day is not peculiar. Other nations have gone through their periods of readjustment and civil war with its inevitable aftermath of banditry on a large scale. When conditions have become so bad in their capitals that communications with the outside world have been interrupted, the representatives of other nations have either moved their offices to the ports, or accepted the situation and taken their chances in the capitals of the governments to which they have been accredited.

If there is no danger of a repitition of the Boxer outbreak, then the continued presence of the armed forces of the powers in North China is contrary to the spirit which animated the deliberations of the Washington conference. Americans in North China have no more right to expect that a regiment should be stationed at Tientsin, than Americans in Shanghai, Hankow, Canton and other parts of China have to demand similar forces to insure their safe access to the ports in the event of internal troubles. If an American regiment remains in Tientsin, we must be prepared at any time to witness another invasion of China by foreign armies. For, it goes without saying, that other powers, in the event of trouble, will insist on sending as strong a force into North China as may be maintained by Americans, in order that the latter may gain no undue advantage.

If a large American force is maintained in North China to see that China gets a square deal in the event of future trouble and to offset advantages that might be obtained by another power whose forces might be numerically greater, then let us also be frank about it so the American tax payer will understand why he is called upon to pay this extra burden. Whatever force such an argument may have had in the past, has been vitiated by the Washington conference. If the time ever arrives when armed intervention in Chinese affairs becomes necessary, there are sufficient troops six days away in Hongkong, Manila, Indo-China and Japan to handle the situation. The continued presence of the American troops in Tientsin is opposed to the best interests of both China and the United States.

Owing to the disturbed and uncertain political conditions in China, with Canton proclaiming the illegality of the Peking president and cabinet, maintained in power largely through the recognition of foreign governments, the presence of foreign troops in North China gives an undue advantage to Peking as against the claims of Canton. Their presence, therefore, constitutes a direct intervention in the internal affairs of China, and materially strengthens the arguments of Sun Yat-sen and the southern government. Take the foreign troops away from North China, and if the legation staffs and foreigners resident in Peking are reluctant to take their

chances in the event of disturbances in the capital, let them remove to Tientsin or some other safe place, and permit the Chinese to settle their own affairs in their own way. As long as the legations remain safely in Peking protected by their guards with an American regiment keeping open the railway line to the sea, so long will a settlement of China's internal difficulties be delayed. Once these troops are withdrawn, and foreigners resident in Peking provide proof of their fears by removing to Tientsin, the prestige of the Peking government will wane and a way soon found for the long delayed unification between North and South.

It is natural to suppose that the legations and foreigners resident in Peking will be extremely loath to entertain any proposition that might disturb their repose, and that many excellent arguments will be presented in order to keep American troops in North China. But if this is to be done, let the facts be clearly understood. Let us be consistent. If the presence of an American regiment in North China is deemed necessary for the protection of American lives and properties growing out of the uncertainty of the political and military situation and the activities of bandits, American residents in Hankow and Shanghai have the undoubted right to demand similar protection, and because of the same perturbed conditions existing in northern Manchuria, Japanese residents in Harbin have the same right to demand a regiment or so for their protection against the Hunghutzes and the Red armies of Lenin. Keep the American troops in North China if conditions so warrant, but let Americans forever after close their mouths about the presence of Japanese troops in parts of China where the lives and properties of Japanese are exposed to the uncertainties of the military and political situation and bandit activities.

Geo. Bronson Rea.

China's Mineral Resources

Is it not about time that a stop be put to propaganda about China's unlimited mineral resources, and face the truth ? For many years the world has been told of the Klondike-like opportunities existing in the development of China's mineral resources until it has become accepted as a fact. As a result of this campaign, many mining engineers and prospectors have been lured to China in the hope of striking it rich, and have departed very much out of pocket and disgusted with the prospects. A sample of this propaganda is seen in a recent statement by Roger W. Babson, the famous American economist, in which he says :

" China to-day has the greatest natural resources in the world. The greatest virgin deposits of coal, iron and copper are in China. It possesses great undeveloped water powers, wonderful fertile valleys, and great primeval forests. By nature it is the richest country in the world. But unlike South America, which is also rich in natural resources, China has a great and industrious population. The largest available labor supply in the world can be found there to-day."

Such broad unqualified statements can result in no permanent benefit to China, for investigation only proves their fallacy. The great undeveloped water-powers exist perhaps in the Far western provinces, but it will many, many, years before they can be made available to turn the wheels of industry. As to great primeval forests the same statement holds good. Such forests as China possesses are so far from transportation, that it will take another decade or so of railway construction before their timbers can reach a market. As to the virgin deposits of coal, iron, copper and other minerals, it is better to listen to what mining experts have to say on this subject.

The foremost mining expert of the United States, H. Foster Bain, director of the bureau of mines, expressed himself as follows before the Engineer's Club of Philadelphia :

"The field for the American mining engineer in China, is limited. Notions of great mineral wealth in that country have persisted even since the time of Marco Polo, but they are exaggerated. Some coal of an excellent quality is found, but there is no reason to suppose there are any large quantities of iron ore. One company in China produces about 150 tons of steel annually, although market problems make the situation somewhat involved. What is true of steel is true also of lead, copper, silver and some other ores.

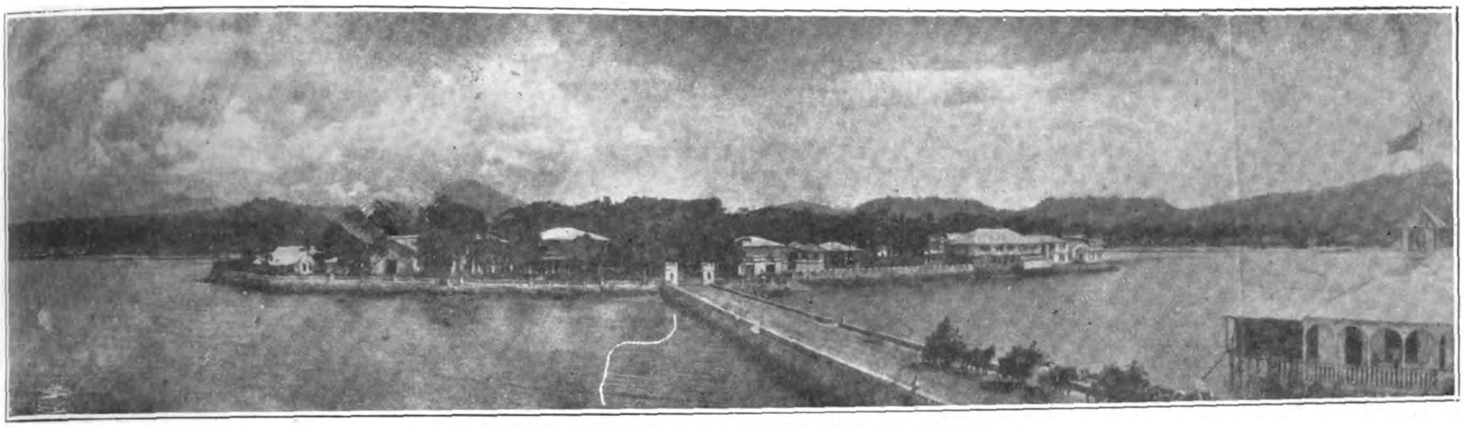
" It is possible a future Klondike may be found in China, but political disturbances interfere with development and the gold is in a region infested by bandits. The largest antimony deposits in the world are in China and, if these are properly developed, that country is capable of controlling the world's supply.

"The future of mining development in China will remain with Chinese engineers, although there is a field there for foreign engineers to make examinations and reports."

This statement is entirely in line with a similar one made by the British commercial attaché at Peking in his 1920 report on the trade of China. The mining possibilities of China have been greatly exaggerated. The concensus of export opinion after careful investigation is unanimous on this point.

Undoubtedly much remains to be done in the development of China's mineral resources and every assistance should be extended to the Chinese in their exploitation, but the great expectations that foreign capital will control this industry should be discouraged until the Chinese show some disposition to remodel their laws and permit foreigners to direct their investments in this field of industry. This disposition, however, is slow in manifesting itself. On the contrary, the tendency is to develop the mining resources of the country by native capital, which is amply attested to by the number of mining permits issued by the government at Peking and the increasing demand for mining machinery from these native concerns. The *Mining Journal* of London, in commenting on the survey of the industry as presented at a recent dinner of the China institute of mining and metallurgy, says :

" One of the most important directions in which China will be influenced by the possibility of modern industrialization will be in connection with the mineral industry. There is apparent a considerable amount of parallelism between the position in China and in India. In either case there are vast populations offering an abundance of cheap, if unskilled, labor, and untapped markets for an immense variety of things which have become necessities of life in other countries, and which the Chinese have shown every desire to acquire when the means are placed within their reach. In both cases the leading mining possibilities are in connection with coal and iron and the industries which subsist upon this combination. A country which is already producing between 20 and 25 million tons of coal and some 2 million tons of iron ore is worthy of attention ; and where China differs from so many of the newer fields of mining and industrial enterprise is that no limit can be set to the extent of development of future years such as is suggested by an examination of colonial fields where the productive and consuming power of the individual is already perhaps rated more highly than in the great industrial centres of Europe. Steady progress is already being made in the organization of a mining administration, and it would seem, at any rate, as though the officials were endeavoring to work on lines approved in the big mining countries of the West. Very possibly these efforts are still somewhat academic and have not taken any real root in the life of the Chinese, but when a start does take place in China, progress is often rapid. China, to-day, governs the wolfram industry and, to a large extent, antimony also. Chinese policy of late has dictated that mining and associated enterprises shall be, in part, national in consitution, and on account of the local complexion of such enterprises we hear less of the development of which is going on than if the work was undertaken by companies registered in this country. The development of the mining industry in Japan, since the Chino-Japanese war, has been extraordinary. If Japan, with a population of 45 millions, can do so much, the potentialities of the mineral industry in China are difficult to compute.



The Old Town of Jolo, capital of the Sultan of Sulu

The Sulu Archipelago

Its Natural Resources and Opportunities for Development

By P. J. Wester, Agricultural Advisor

THE Sulu Archipelago is a group of islands located between 119° and 122° east longitude and between 4° and 7° north latitude, extending in a southwesterly direction from Basilan to Borneo, bounded by the Sulu Sea on the north and the Celebes Sea on the south and east. The entire length of the archipelago is approximately 137 miles, and it includes about 130 fairly large islands, most of which are inhabited, and some 170 islets and reefs chiefly of geographical interest. The Sulu archipelago has an estimated area of 1,030 square miles and a population of 156,212 inhabitants according to the census of 1919. All the larger islands in the Sulu archipelago are of volcanic origin, and their location and the topography of the sea bottom suggests that they may have been the connecting link of a continent extending from Mindanao, the Visayas and Luzon in the northeast, to Borneo in the southwest.

The Sulu archipelago is usually considered in two large groups, the Jolo group and the Tawitawi group. These two agglomerations are again divided into 13 small groups, is as follows :

The Samales group ; the Jolo group (Jolo is the largest island in the archipelago ; and here Jolo, the provincial capital, is located) ; The Pangutaran group ; the South Jolo group ; the Tapul group ; the Kinapusan group ; the Tabuan group ; the Tawitawi group ; the Sigboye group ; the Tataan group ; the Sibutu group ; the Pearl Bank group and Cagayan de Sulu group.

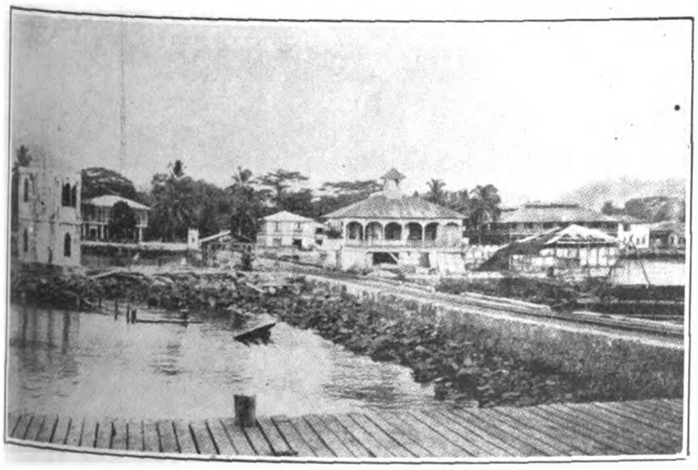
The majority of the smaller islands and reefs are coraline and the approach to many of these is very dangerous and difficult because of the shallow water and the narrow, tortuous channels between the reefs.

Among the islands worthy of more than passing mention : Bakungan is a precipitous, densely wooded island about one mile long and half as wide, located about 11 miles east of Jolo. The inhabitants are occupied principally in fishing.

Bongao is a small, rocky island off Sanga-sanga, with good anchorage. The precipitous mountain of the same name is about 340 meters high and a striking landmark from a great distance. Farming and fishing are the principal occupations of the people. The town has a small dock approachable by a good-sized launch.

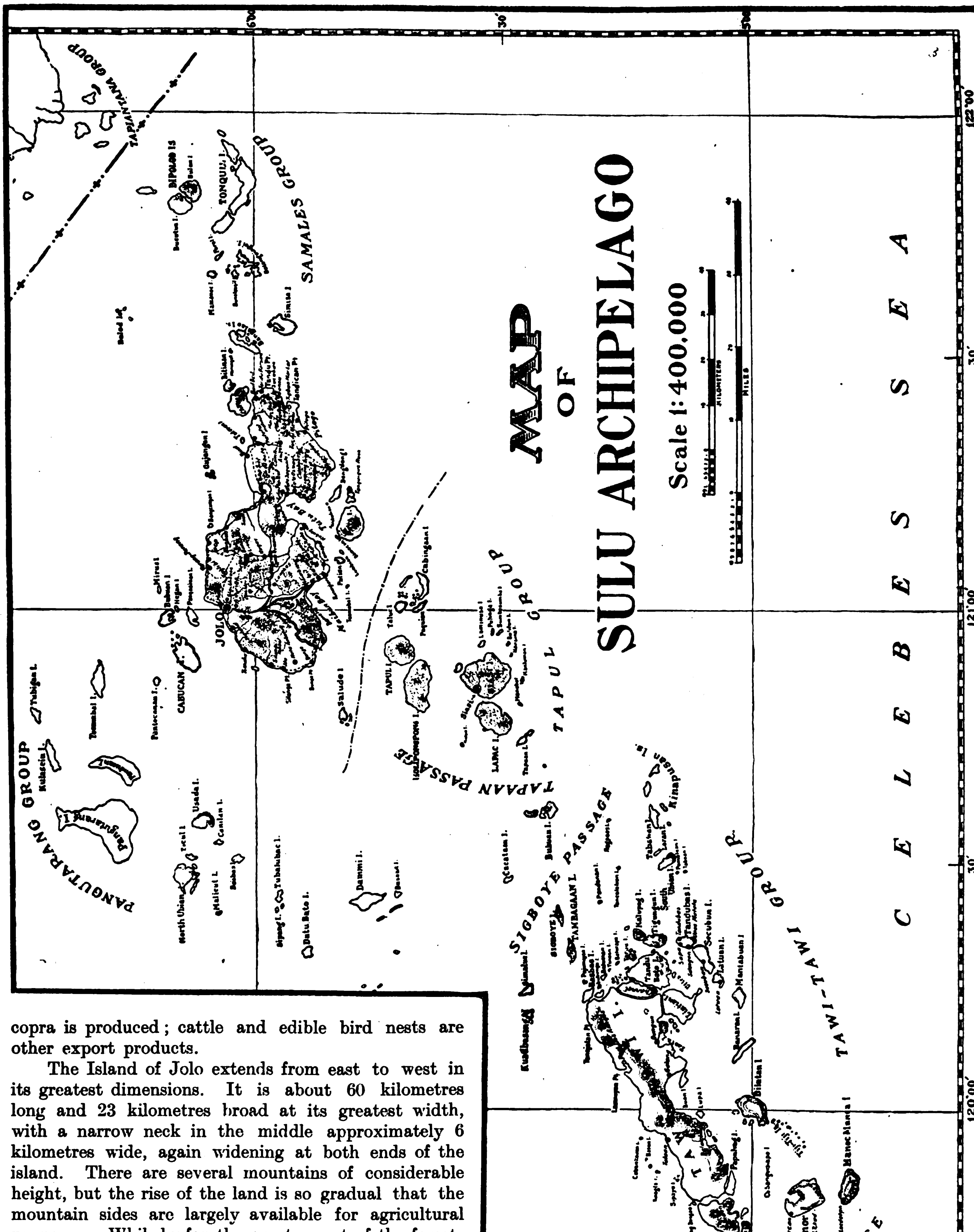
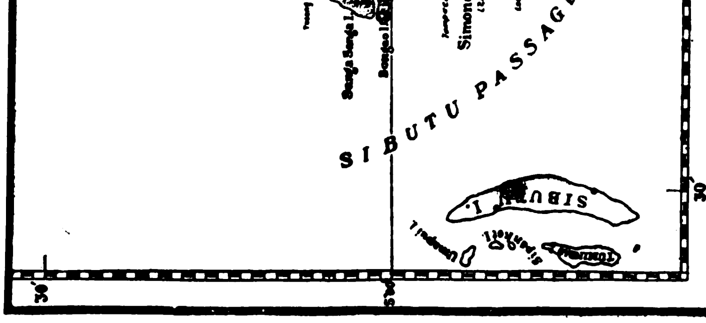
The little Island of Buan, located about midway of Tawitawi on the south side is difficult of access and can be approached only by small motor boats and vintas. It is mentioned because of its numerous springs from which water is obtained by the inhabitants on the neighboring islands. The principal occupations of the population are fishing and farming.

Cagayan de Sulu is about 8 miles long and 5 miles wide, and well elevated above the sea, culminating in a mountain 330 meters high. The island has two small, deep lakes near the south coast and many springs with excellent drinking water. The anchorage at the dock is very good. The island is very fertile and considerable



A view of the Town of Jolo from the Landing Stage

Old City Gate to Jolo as viewed from the Landing Stage

copra is produced; cattle and edible bird nests are other export products.

The Island of Jolo extends from east to west in its greatest dimensions. It is about 60 kilometres long and 23 kilometres broad at its greatest width, with a narrow neck in the middle approximately 6 kilometres wide, again widening at both ends of the island. There are several mountains of considerable height, but the rise of the land is so gradual that the mountain sides are largely available for agricultural purposes. While by far the greater part of the forests were long ago cleared away there are still considerable areas in forest of which teak is the most valuable.

The landscape of Jolo is extremely pleasing, with its general configuration of a series of mountains and hills of gentle slope rising out of the sea, undulating hills and valleys, mostly cultivated, or overgrown with cogon and other grasses.

Port Tulayan, to the east of Jolo on the north coast, is the best harbor on the island and possibly may some day become of importance.

Jolo, the provincial capital of the Sulu archipelago, is located on a wide bay on the north side on the western end of the island. The city is connected with Zamboanga by cable, and has a local telephone system reaching out to several of the more important island villages. The road system on Jolo is rather incomplete, though one may reach Maibung, Parang, Indanan and Camp Romandier by auto.

The *Islas Filipinas* calls from Manila and Zamboanga twice monthly and there are monthly steamers between Singapore, Sandakan, Borneo and Zamboanga which call at Jolo in passing that port each way. Various smaller craft maintain additional communication with Zamboanga and the Sulu island ports of Siasi, Bongao, Sitanki and Cagayan de Sulu, where there are small docks.

Laminusa is a small, low coral island about a mile long largely covered with mangroves. It has a good anchorage but poor water, and is mentioned chiefly because of its pearl and trepang fisheries. Excellent mats are made and exported from Laminusa.

Laparan is a low coral island some seven miles long, in the interior of which is a large lagoon about three miles long. The island has no water and is uninhabited.

Lapak is located across the narrow channel from Siasi and has good anchorage on the north and south coasts. The water, obtained partly from springs and partly from wells, is good. Farming and fishing are the principal occupations of the people. Some copra is exported. Lapak is nearly five miles long and three miles wide, with two mountains at the opposite ends of the island, the one in the north 300 and the one in the south 450 metres high, with a wide plain of good to excellent agricultural land in the middle, practically all uncultivated and overgrown with cogon. Attempts have been made by American planters to grow rubber and cassava on this island but all of them have failed.

Lugus is about four and a half miles long and three miles wide, with a good anchorage on the northern and the west coasts. The land formation is a series of fertile hills rising to one peak about 290 metres in height. There are two small lakes on the island but the drinking water is poor and brackish. The population subsists by farming and fishing, the island being quite well cultivated. Copra is the principal export article.

A Road in Jolo

Mantabuan is a small, flat, quite populous island to the south of Tawitawi, with a good anchorage in the channel between it and Latuan island. The population is occupied principally in fishing. Some trepang and shells are exported.

The little Island of Manubul, located a little way from Lapak to the southwest is one of the fishing centres of the Sulu archipelago, exporting dried fish, shark fins and trepang. The anchorage is good but there is no drinking water on the island.

Manukmankau is a flat coral island about two miles wide and twice as long lying a little to the south of Simunul. The anchorage is poor. The drinking water is of fair quality and is obtained from a small pond in the centre of the island. The people are occupied principally in farming, especially in growing a tobacco which by the Sulus is preferred to all other kinds. Some rattan mats and pottery are also made for export.

Pangutaran is a low, flat coral island some 10 miles long with good anchorage, but having very poor drinking water. Farming is the principal occupation of the inhabitants who export copra and cattle.

Panducan is a low coral island, some 6 miles long and about 2 miles wide, located about 23 miles northwest of Jolo. The people are occupied chiefly in farming. Copra, cattle and mats form the articles of exports. The anchorage is good on the south coast. The drinking water is very poor.

Pata is an almost circular island of volcanic origin about four and a half miles in diameter with a mountain in the centre some 330 metres in height. Pata has a good anchorage and good drinking water from springs. The island is well elevated above the sea, the soil is fertile, and most of the land is under cultivation. Copra and cattle are exported.

Sangasanga is an island about 6 miles long located between Tawitawi and Bongao, the population of which are occupied chiefly in farming.

Secubun is a small, low flat coral island with poor and brackish water, the inhabitants of which support themselves by farming and fishing. Dried fish, trepang, pearl and tortoise shells and copra are exported from Secubun.

Sibutu is a long, narrow island some 16 miles long and perhaps 4 miles at its greatest width, lying southwest of Bongao and only about 25 miles from Borneo. The island is partly of volcanic origin, partly coralline. The people are occupied chiefly in farming and cattle raising though some dried fish and trepang are exported. The cutting of railroad ties is the principal industry.

Simunul is a flat rocky island south of Bongao about eight kilometres in diameter. There is no good anchorage off this island and the water is good, being obtained from springs in the centre of the island. The exports are principally pearls, shells and trepang. Wild hogs are quite numerous and there are many wild carabaos descended from escaped domestic animals, most of the island being tilled. Chongos Bay on the southeast coast is a good harbor.

Siasi is an almost circular island of volcanic origin some 10 miles in diameter located 37 miles southwest of Jolo, and is the third most important island in the Sulu archipelago. There is a gradual and even slope of the land from the sea to the top ofMount Gorra in the centre, attaining a height of 400 metres. The soil is fertile and the land is largely cultivated up to the mountain top or overgrown with cogon. The town of Siasi has a good anchorage and is equipped with a water system. The water, which is excellent, is obtained from springs on the higher slopes of the island. The inhabitants are occupied chiefly by farming and fishing, and copra, abacá, cattle, dried fish, shark fins, trepang, pearls and shells form the export products.

There is a small ceara rubber and robusta coffee plantation in Siasi owned by an American corporation. Local industries include mats, pottery and shell bracelets.

Sitanki is a small island and seaport southwest of Bongao and west of the south end of Sibutu with a good anchorage, but all drinking water is obtained from Sibutu. Some dried fish, trepang and shark fins are exported.

South Ubian is a small, low and flat coral island about 64 miles southwest of Jolo with a good anchorage, but having very poor, brackish water. South Ubian is one of the most thickly populated islands in the archipelago and is well cultivated. Pearls and shells and trepang are exported from South Ubian.

Tandubas is a small island southeast of the east end of Tawitawi. Agriculturally the island is of no importance but it is quite populous, the inhabitants being occupied with fishing. Pearls and shells and trepang form the chief exports. The anchorage is good on the east coast of the island opposite the town of Ungas Matata. The drinking water is poor and brackish.

Tapul is an island of volcanic origin and with a good anchorage, located about 25 miles southwest of Jolo, the highest peak rising to an elevation of 500 metres. The island is nearly circular and about eight miles across, with springs in the interior that provide good drinking water. The greater part of the island is under cultivation and it is considered as one of the most prosperous in the archipelago. Excellent mandarins are produced. The exports include coconuts, hemp, citrus fruits, pearls and shells, trepang and dried fish, and some cattle and horses.

Tawitawi is the second largest island in the Sulu archipelago, being some 35 miles long and 13 miles broad at its greatest width. Unlike Jolo, Tapul, Siasi and Lugus, whlch are well adapted for agricultural purposes, the topography of Tawitawi is very broken, rough and mountainous with a range of mountains extending throughout its entire length of which several peaks rise at 300 metres or more, one, the Bihabiha, attaining a height of 580 metres. Several small rivers or, more correctly speaking, streams, find their way from the interior to the sea ; of these the Dungun and Malum Rivers are the largest in the Sulu archipelago. The anchorage on the north coast is good, which is also true on the south coast as far as the town of Balimbing. Drinking water is good and plentiful. Nearly the whole island is covered with dense forest which as yet is largely unexplored. Some railroad ties are being cut and shipped out of the island, but because of its mountainous character Tawitawi will never attain any importance agriculturally.

Tonquil is a narrow, crescent-shaped, flat coral island about 10 miles long located south of Basilan and east of Jolo, with a good anchorage but poor, brackish water. A large part of the island is covered by mangrove. The exports include dried fish, trepang, pearls, shells and copra.

To the traveler with a love and appreciation of scenic beauty, picturesque surroundings and a study of the primitive, simple life, sufficiently spiced with danger to render the experience more fascinating than an ordinary outing, a cruise through the Sulu Sea is certainly to be recommended.

Next to Jolo, Siasi is the most important trading centre in Sulu. The anchorage is good and the channel between Lapak furnishes a reasonably safe harbor. The soil is fertile. Also, a large part of the island is under cultivation.

Climate

The climate of Sulu is mild without violent changes in temperature. The nights are always cool.

The rainfall is plentiful and equally distributed throughout the year.

Population

The population of Sulu, numbering 156,212 souls, is greater than that of any province in the department of Mindanao and Sulu, though in area it is smaller.

Tribally the population may be divided into three groups. The Sulus are the most advanced of the native inhabitants, who, before the advent of the Spaniard and American, were the ruling people of Jolo. The Sulus constitute the agricultural population of the archipelago and from them are largely recruited the labor employed in cutting railroad ties, the one industry in Sulu in which Americans are engaged. They are also engaged in fishing and pearling.

The Samals are, together with the Bajaos, in the majority on the smaller islands and on the coasts of Jolo. Both make their living from the sea, and while the Samals are somewhat more advanced in civilization than the Bajaos, there is really very little difference between the two tribes. The agriculture engaged in by the Samals is of the crudest form, while the Bajaos prefer the sea altogether. The Filipinos in Sulu are very few and of the white race there are still fewer representatives. The Chinese trader in Jolo, Siasi, Bongao and Sitanki one may not escape any more than in any other trade centre in the Philippines. He is the almost indispensable link between the farmer and fisherman and the export houses in the centres of trade in the Philippines.

Agricultural Industries and Food Crops

The agricultural practices in Sulu do not differ materially from those in the other regions in the Philippines, and production per unit area could be greatly increased by more modern methods of culture.

Abacá, the principal product of Sulu, is grown chiefly on the island of Jolo ; the quantity of fiber produced on the other islands is negligible. Soil and climate both are well adapted to abacá over a large area of Jolo island and the area planted could be increased very considerably, especially in the interior. However, the extension of the abacá plantations may well be left to take care of itself. The more urgent measures are the education of the Moro farmer in the need of more thorough preparation of the land before planting, better cultivation and instructions in stripping and grading of the fiber.

Copra constitutes the second largest export article of Sulu but it will unquestionably supersede abacá within the next few years. Most of the copra is probably produced on Jolo island though there are few inhabited islands where coconuts have not been planted. On the outlying islands the largest number of coconut trees are found on Tonquil, Pangutaran, Bangalao and South Ubian. However, the nuts are, to a great extent, consumed as food in the localities where they are grown. In systematic planting and care of his trees the Moro appears to be behind the Filipino planter in the Visayas and Luzon, in fact, it is doubtful whether there are any, even small plantations, regularly spaced or otherwise properly cared for, and there is a crying need for far advisers to set the people right in these respects. This is equally true in regard to control measures for beetles and weevils. To no other crop are the numerous coral islands so well adapted as to coconuts and too much could not be done to encourage the extension of coconut plantations on these islands.

Cattle raising is another industry that goes well in hand with coconuts on the larger islands where good water is available. It is especially worthy of attention considering the isolation of the islands and the ease with which diseases can be kept out of this region.

From the export figures, it might be inferred that rice beyond the needs of the population was produced, whereas the rice imports rose to P.900,000 worth in 1918. Several varieties of upland and lowland rice are grown, upland rice predominating. Most of the rice is grown in Jolo.

In 1918, there were 20 small sugar mills in operation in Jolo but these of course were all of a very primitive type and the quantity of sugar produced was insignificant. Considering how well adapted to coconuts, coffee, rubber and abacá Jolo Island is, and how well occupied the land in small holdings by the present population, there does not appear to be much room for a sugar industry and it is probable that land now planted to sugar cane could be far more profitably occupied by other crops.

Corn is not of especially great importance as a food crop in Sulu. Cassava is very extensively grown, there being possibly a greater area planted to cassava than to any other single crop. Camotes, ubi and gabi are also grown to some extent. Other crops of less importance are borona, sesame and adlay.

The more popular vegetables include patani, squash, patolas, pepinos, tomatoes, watermelons, chili and kankong. Sago is made from the sago palm.

Fruits

Jolo is noted for its many fruits, and the climate and soil are very favorable for fruit culture. Mangosteens, baunos, marangs, huanis, durians and rambutans, unobtainable nearly every where else in the Philippines, are abundant in Jolo, in addition to many other fruits, such as the lanzon, bulala, papaya, banana, jak, etc.

Forest and Forest Products

At present there is only one sawmill in operation in Sulu ; it is located in Jolo.

Properly developed the forest products of Sulu should become a very important source of revenue. Public commercial forests are located on Tawitawi, Sibutu, Sangasanga, Simunul, Manukmankau, Lintian, Tandubatu, Basbas, Tata, Ampoy and Tabulunga. These forests contain much the same timbers as the forests in other parts of the islands, both hard and soft wood, such as: ipil, *intsia bijuga, pahudia rhomboida* and *adenanthera intermedia;* yakal, *hopea* spp., *isoptera borneensis,* and *shorea balangeran;* calantas, *toona calantas* and *azadirachta integrifoliola;* lumbayao, *tarrietia javanica;* guijo, *shorea guiso;* narra, *pterocarpus indicus* and molave, *vitex parviflora* and *V. pubescens.*

The only commercial teak forest in the Philippines is located in Jolo, being some 2,500 hectares in area. This is now being logged by the province on a small scale. The most important forest product is railroad ties. Almaciga formerly was collected in considerable quantities but production dropped off to a negligible quantity during the past year. Gutta-percha and gambier have never been collected in appreciable quantities. Some tanbark is obtained and this is an industry that could be increased very considerably. Some lumbang nuts are collected and exported. The archipelago produces a small quantity of cinnamon. These minor products will never attain much importance, but lumbering, the cutting of railway ties and the collection of tanbark are capable of development into industries of considerable magnitude.

Mining

There are no mining operations in progress anywhere, though manganese has been discovered on various islands and gold has been found in Jolo. Oil has been reported from Siasi but no attempt has been made to make borings. It is quite possible that the manganese deposits are large enough to be worth investigating considering that, according to analyses made by the bureau of science, the ore contains 62 per cent. pure manganese.

Marine Industries

Pearls, pearl shells, tortoise shells, fresh and dried fish, trepang and shark fins constitute the marine products of Sulu.

The shark fin industry has been of steady growth, but no effort has been made to make oil from the shark livers and guano from the sharks themselves. Diving and fishing for pearls and shells is one of the most important industries in the Sulu archipelago which produces most of the shells and pearls for export from the Philippines. Moros as well as Japanese and Chinese are engaged in this work.

There are many sponge beds in the Sulu archipelago and several attempts have been made to engage in sponge fishing, which, however, has been abandoned within the last three years. The sponges are reputed to be of good quality. Failure to cure them properly is said to have caused their arrival in the United States in bad order.

Trepang fishing could undoubtedly be engaged in on a far greater scale than at present, which is probably also true of tortoise catching. It is of interest to know that young tortoises are frequently caught and kept in captivity for several years before they are killed. One of the curious sea products of Sulu is the so-called "sea horse," a small animal with head and neck like a miniature horse, which is dried and exported to China because of its supposed medical value.

Prospective Industries

With few exceptions the development of the industries of Sulu archipelago would appear to lie in the hands of the present abitants, and opportunities for investment by big capital are many. There is unquestionably much timber, especially in itawi, but the broken topography of that island would pro- make transportation of logs from the interior to the sea difficult and expensive than in other parts of the Philippines. ad ties can be brought out more readily, and this industry e expected to expand during the next few years. Considerable teak may be expected in the market from the government reservation but owing to the small area of this forest no very great output can be anticipated for more than a short period. Whether the pearl beds are so extensive that a larger pearling fleet could find profitable work is doubtful. On the other hand it would appear that a well organized sponging outfit, prepared to properly care for the harvested material and place it on the market would be profitable. The value of the pearl and sponge fisheries might be greatly enhanced by the judicious planting of new beds.

As the shark fin industry grows there would appear to be room for a small guano factory to take care of the shark meat and to prepare the oil from the livers that is practically a total loss at present. It is not generally known that shark liver oil is very similar to, and can be used for, all the purposes for which cod-liver oil serves.

Broadly speaking, the great agricultural export crops of Sulu will always be copra or coconut oil and abacá. The plantations will be small and probably always remain in the hands of the Moros. There is not sufficient public land available at any one point to induce the American and European with his heavy overhead expenses to engage in coconut growing in this part of the world, considering how much more favorable for plantation ventures all conditions are in Mindanao and Basilan. The same, is, of course, true of para rubber. Coffee is well adapted to native culture and on Jolo there are numerous streams that could be utilized in preparing the coffee, so that there is no reason why, with the adoption of a more diversified system of farming by the Moros, coffee should not become a crop of some importance. In some sections there is excellent tobacco land.

Much land within a radius of eight kilometres of Jolo that is too shallow for other crops could, to advantage, be planted to pineapples, and a cannery in Jolo would be at the same time within easy reach of the plantation and of the wharf, and it might in part be employed for canning fish.

In fine, a region of unsurpassed scenic beauty and romantic interest, inhabited by a virile race of picturesque, interesting people, the Sulu archipelago, with an older authentic history than any other part of the Philippines, is of unusual interest to the traveler and tourist. Already quite densely populated, Sulu offers but little inducement to the investment of big capital, especially along agricultural lines, and apparently is destined to be developed chiefly by her sturdy native inhabitants.

ERRATUM

Mr. Oei Tjoe

On page 147 of the March issue lines 32 and 33 should read:—

A native of Amoy, he went to Java to learn the sugar business, and in the course of time invested his earnings in sugar properties.

Russian Timber Industry

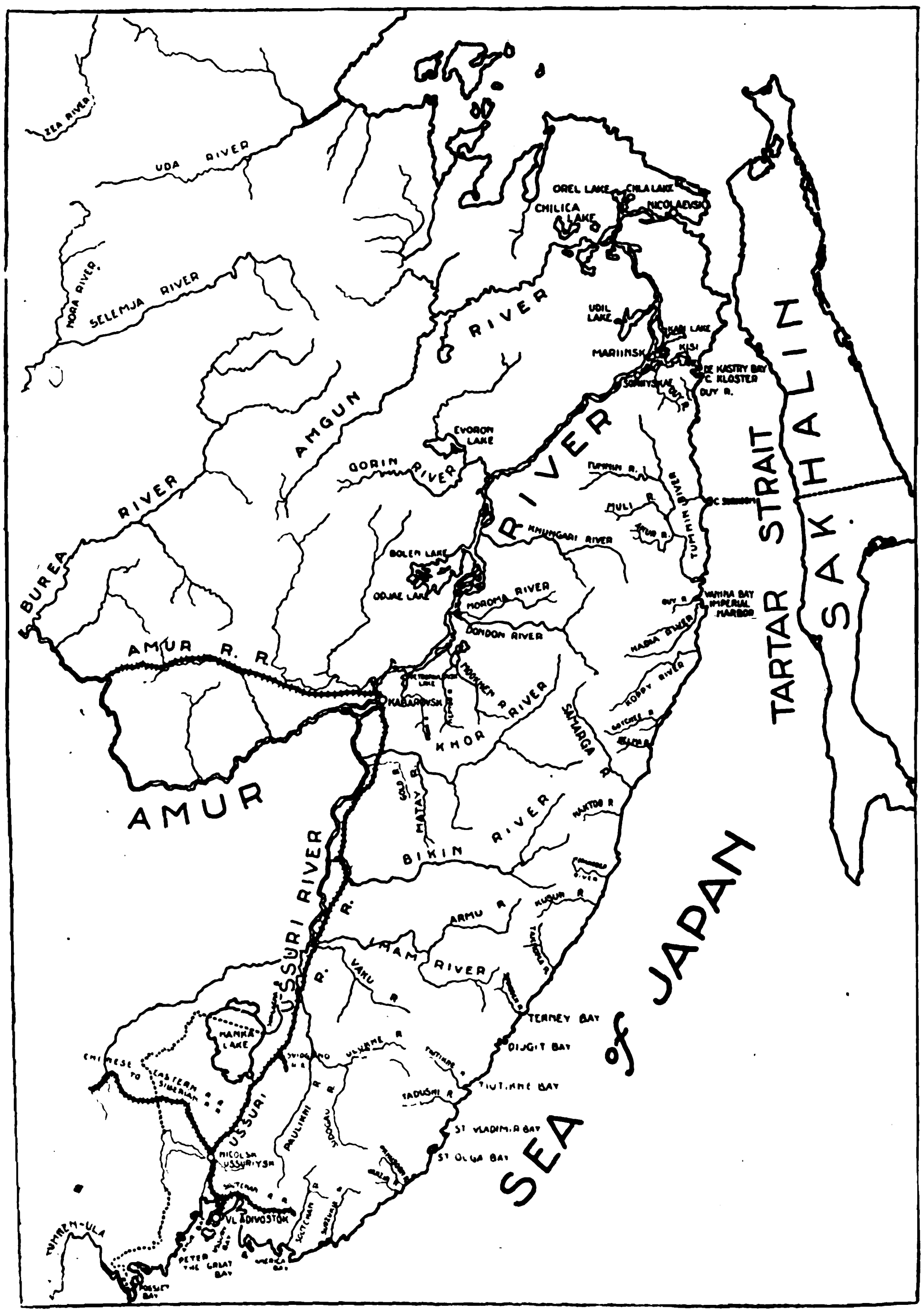
By W. Jacob in "The Timberman"

IN the month of July the working year of the chief timber committee came to a close. The operations of the committee had been carried through under most difficult conditions and discouraging circumstances. The months of January and February were characterized by a fuel crisis; when it became necessary to rely on the removal of timber in order to maintain traffic on the railways, and to slow down the preparation of timber, which of course produced its effect of later operations in respect to a reduced removal of goods in March and April. On the other hand the severe crisis in provisions was keenly felt throughout all the operations of the chief timber committee and its local organizations.

To these leading factors that interfered with the success of operations during the working year 1920 1921 must be added a purely meteorological factor resulting in the low level of the river waters through the absence of rain, which made floating difficult, and reduced both the period of time and the geographical limits within which it could be done; for on a great number of small rivers on which under ordinary conditions timber could be floated in the spring time, such could not be done last spring. All these factors influenced the issue of the timber operations discouragingly, reducing the quantity prepared and consumed. Only with incredible exertion and close organization both on the part of the chief timber committee and its local organizations, accompanied by the development of every energy and initiative was the timber business, closed in the working year named, more or less satisfactorily, to the extent of 70 per cent. of the program that had been marked out.

According to data, not altogether complete, affecting the preparation campaign 1920-1921, the quantity of firewood prepared was 9,500,000 cubic sagens (one cubic sagen equals 343 cubic feet) and the quantity removed was eight million cubic sagens; and the quantity of industrial timber prepared was two million cubic sagens and the quantity removed 1,200,000 cubic sagens. Thus the total quantity of timber prepared in some form or other was 11,500,000 cubic sagens and the quantity removed was 9,200,000 cubic sagens.

Such is the result of the timber industry in the preparation of and provision of fuel and timber materials required. In the wood-working industries there were 1,100 factories engaged, running 1,900 frames; and 550 factories with 980 frames were idle. The product of work done in the sawmills during the past working period, from October 1, 1920, to May 1, 1921, according to the reports of 37 local organizations (the others not having supplied full particulars), was 42,840,000 cubic feet. But taking the whole yield for the period as 46,500,000 cubic feet, which is believed to be correct, the program marked out for these mills was exceeded by 8.5 per cent.; that is that the total production amounted to 108.5 per cent. of the quantity required of them by the chief timber committee.



Map of the Amur River Basin, the Great Lumber Centre of Eastern Siberia

Export Situation Becoming Normal

The export operations during the working year under review were most effectively carried out on the western Dwina, at Riga, to where 165,000 logs were directed. The export of sawn timber is gradually becoming regular, and at the present moment in the neighborhood of Petrograd there are about 300,000 standards of export timber. Recently the Soviet foreign export committee has been actively engaged arranging for the shipment of this timber.

The timber program for 1921-22 is closely governed by these results as attained in the past working year, and the resources that may be anticipated for the current year.

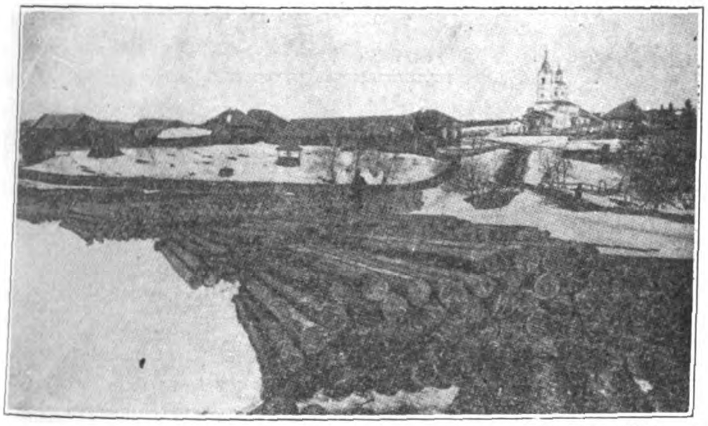
Thus it is proposed to prepare and remove for government requirements, firewood, etc., to the extent of 10,500,000 cubic sagens, and industrial timber to the extent of three million cubic sagens, or a total of 13,500,000 cubic sagens. For the execution of this program there remain along with the timber prepared in previous years in the forest, up to seven million cubic sagens which are to be considered the basis of timber supply, from which dry firewood is to be drawn for requirements in the course of subsequent working years or periods. Relatively the heaviest burden will lie on the governments of Viatka, Perm, Uphim, Simbirsk and Nizhegorod, which have been struck by the bad harvest; and this may of course necessitate the program of distribution to be lighter on these governments and the difference to be made up by other governments. Besides the program mentioned, the chief timber committee has planned a regular preparation of 15 million sleepers for the railway department. To execute this program the timber committee has formed a special sleeper section.

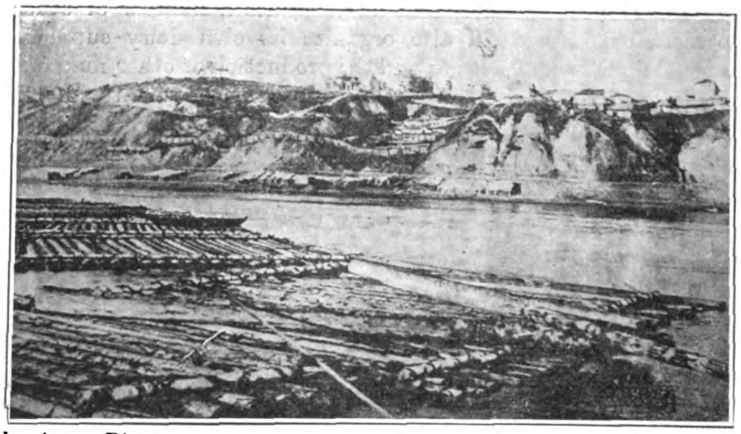
A Siberian Forest

doing all it can to provide for this supply.

The next most important consumer of timber is the mining industry, for which large quantities of props are required. The preparation of mining timber is worked out in a plan, and is distributed per region and government, to produce a total of 180,000 cubic sagens of oak and coniferous wood. The total quantity provided for in the 1921-1922 working year in respect to the inland market is a little over 110 million cubic feet and the total quantity arranged for in the same period for factories working for export is a little over 15 million cubic feet.

The chief timber committee is devoting particular attention at the moment to this question of export, which is recognized as an urgent department of business, not only because it helps to strengthen the industry itself and to insure its further development, but also because it furnishes the public with the means to purchase other kinds of fuel and thereby improve the fuel budget.

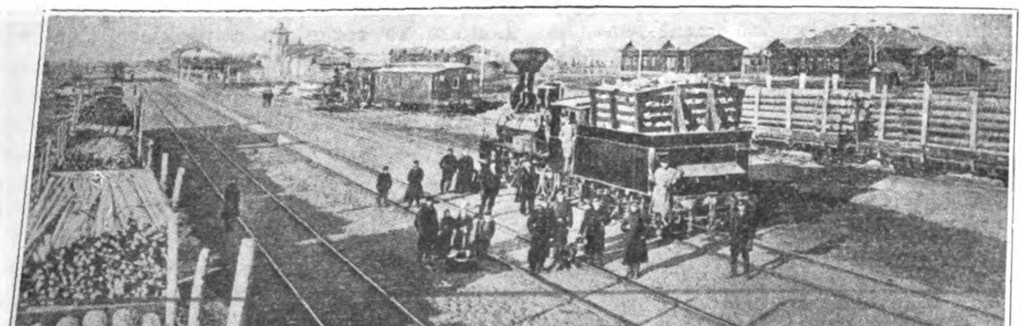




Lumber Rafts on the Amur River

Sleeper Districts Formed

Separate sleeper districts will be organized, where both the supply of the timber and its cutting at the factories will be specially superintended; and local organizations will be invited to assist. The next most important consumer in a government sense is the supplies (provision) committee. Here it is a question of packing materials, including the cooperage industry, which is mostly concentrated on the Caspian Sea; but later it is proposed to take measures to develop it on the shores of the Black Sea. Until now the cooperage industry on the Caspian Sea has been occupied mostly in providing tare for the fishing industry. For the moment this work is hindered by the limited supply of material for making casks, and the ...ine in the district, ...e it ought to be ...d out, namely Tartar Republic along the River ...a. The chief committee is



Where the Wood Burning Locomotive Hauls Long Trains of Logs and Cut Timber for Building the Cites of Siberia

North Russian Timber Trust

A timber trust has been formed in North Russia under Soviet government auspices, the duties and rights of which are very extensive, including a control of both old and new timber concerns; that is, concerns that are served by the White Sea ports. Mr. Liberman, who is the managing director of this trust, in an interveiw with a Latvian journalist, said that the board of the trust is composed of experienced people, which assures it of competent guidance. This trust, which goes under the name of "Severoles," operates in a district that works almost entirely for foreign markets. And for food supplies and such like it will even depend for some time on foreign sources. The trust will operate with considerable freedom from government control; but is obliged to set apart 20 per cent. of its revenue every year for equipping and developing the northern district. The resources of this

trust are listed as follows: The area handed over to it by the government makes about 30 million dessiatines of forest land, and the number of saw frames already in the area is 180. It has received the requisite funds to buy up the sawn wood in the area under its control, which it is under obligation to realize on the foreign market. In material means the trust is fully assured and it can begin work at once.

At first it will operate with its own means and start the 180 saw frames ; but it will endeavor to make terms with foreign capital, for the 180 frames referred to can barely deal with a quarter of the timber resources at the disposal of the trust.

Mr. Lieberman suggested several ways by which foreign capital might share with the trust in the development of Russia's northern timber lands. He insisted that there is plenty of room in Russia for work and that foreign enterprise may take a hand at once; therefore the question of granting concessions for the erection of new concerns is an immediate one. He had every confidence in the success of the big concern at the head of which he stands.

Talking of the timber ready for export he said that of 130,000 standards available 50,000 standards are ready to be shipped. The program of operations for 1921-1922 has already been drawn up. He has been put in possession of ample funds for the importation of the necessary provisions until navigation closes, and the first steamers bearing such provisions from abroad are already on the way to Archangel.

The establishments handed over to the timber trust include two rope works with all their raw material, and one textile factory with 175,000 poods of prepared flax, besides a number of other concerns. This trust will also organize its own dairy supplies, fishing stations, soap factories and the production of other material for the chemical treatment of wood, the product of which will also be exported abroad.

Japan Oil Reserves

THE Japanese navy which recently contracted to purchase from the Asahi Petroleum Company 400,000 tons of crude oil for fuel purposes still needs 100,000 tons more to use this year and after receiving bids from the Asahi Petroluem Co., Suzuki & Company, the Asano Bussan Kaisha and the Mitsui Bussan Kaisha, have decided to purchase the lot from the last named company for Y.30 per ton. It is said that the Mitsui Bussan Kaisha intends to import most of this oil from California.

Coincident with the placing of this order, it is reported that the naval office will give contracts for the shipment of foreign oil to private companies in order to protect the private-owned tankers. Such tankers as possessed by private firms are the *Tachibana Maru* and the *Manju Maru*, each 3,800 tons, all property of the Teikoku Oil Company, and the *Kiyo Maru*, 13,000 tons, of the Toyo Kisen Kaisha. The *Tachibana Maru* and the *Manju Maru* are now engaging in the transportation of oil from the Persian Gulf to Japan for the company's exclusive use, but upon the prospective merger of the company with the Asahi Petroleum Company next June the transportation from Persia will come to a close. At the same time, these two tankers will take up the service of carrying foreign oil for the navy and will proceed to the Californian coast. The steamer freight will be fixed at the neighborhood of Y.12 per ton.

There is every reason to believe that the usual criticisms will now be directed against Japan for purchasing oil from abroad while her natural resources are estimated to meet her demands at the present rate of consumption for 300 years. Some time ago a section of the American press seemed to see in Japan's unusual importation of American and Canadian lumber, sufficient justification for the basis of another war scare while others condemned her for saving her own timber supplies by purchasing abroad. Whatever Japan does seems to have some sinister purpose for some people, and with the recent report on her petroleum resources read before the American Institute of Mining and Metallurgical Engineers, we may expect further condemnations of her policies. The full report has not yet reached us, but a statement issued before the meeting of the above institute summarized the conclusions regarding Japanese oil resources and forecasting the discolsures to be made.

The paper on Japanese oil resources was prepared by Mr. J. Morgan Clements, a well-known mining engineer and geologist of New York, who maintains that "considering her actual requirements, it appears that Japan is more fortunate than most nations in the possession of oil reserves for the future. Her needs in this respect are not a good reason for the island of Saghalien nor any territory on the mainland of Asia. In fact, Japan possesses much more oil than her propagandists have tried to make the world believe she has."

Mr. Clements recently investigated the Japanese oil fields. He is probably the best informed foreign geologist on the oil fields of that country.

If Japan has an oil supply for 300 years, and the United States for only twenty years at the present rate of consumption, it certainly is time for America to begin saving and to back the state department in insisting on the open in all parts of the globe for oil prospecting and exploitation. America has been very prodigal in exploiting her oil reserves for the benefit of the world and the time must be rapidly approaching when exports must be limited unless American capital and enterprise opens up new fields in other countries. If Japan has resources for another 300 years, it would be interesting to learn the opinion of experts on the oil resources of China.

Japanese Pearls Equal to Natural Gems

A FAR-REACHING decision was recently handed down by the French government when Japanese culture pearls were classified as equal to the natural gem, and as a consequence of this decision a suit for 100,000 francs damages has been filed in Paris by a dealer in the Japanese pearls against the national chamber of dealers in diamonds, pearls and precious stones.

In maintaining his stand in the face of the opinion of French scientists that Japanese pearls are not equal in value to the finest natural pearls, the president of the national chamber of dealers in diamonds, pearls and precious stones is confronted with the possibility of having to pay a member of that body 100,000 francs. At the same time the status of Japanese pearls has once and for all product of Japanese ingenuity now ranks with the precious stones of the world.

The long and bitter fight waged by French jewel merchants against the forcibly grown pearls of the Orient was brought to a climax last November when the chamber of dealers refused to permit one of its members to import forty Japanese gems from London to complete a necklace that had been ordered. This member, M. Pohl, had to make his request to this body, as it held the monopoly on the importation of pearls from all countries. The president of the association, in conformity with the opinion held by that body, replied that Japanese pearls were not in the category of gems authorized to pass the frontier.

M. Pohl appealed to the Japanese embassy, which in turn made representations to the finance minister. The minister, after consulting French scientists, immediately classed the Japanese product in the class of fine pearls. In addition to severely criticizing the syndicate, the government withdrew from that body the control over importation of pearls and placed it in the hands of the French customs.

M. Pohl, having won his case, filed suit for 100,000 francs damages because of alleged injury to his business.

Naval Bases, Radio Stations and Cable Communications on the Pacific

By Richard Ernest Lambert, Lecturer on Ports and Terminals, the School of Commerce, New York University, and Former Lieutenant U.S. Navy and Naval Supply and Disbursing Officer, Honolulu, Hawaii

WITH the control of the Pacific one of the fundamental questions being deliberated by the arms conference a survey of the naval bases and communications has its place. From the point of view herein presented, the terms "naval bases" and "naval stations" have not been used in their restrictive technical sense primarily the endeavor rather has been to picture in the broadest way possible all naval factors as far as is possible.

In order that the reader may have in a single picture that part of the strategic background against which the searchlight of the Far Eastern discussions is being thrown, which is comprised of such bases of major strategic importance as naval stations, radio stations and cable stations, a comprehensive list of such stations is given here for all the countries of principal interest. These lists are submitted without any comment, editorial or otherwise, since it is believed that they speak for themselves—and that most eloquently—, and besides it is believed that the reader will prefer in this instance to draw his own conclusions.

In one or two instances, because of their paramount strategic importance affecting Britain's position in the Far East, British stations not strictly speaking located in the Pacific arena, are included.

I. United States

A. NAVAL STATIONS

(1) Main Land of the United States

San Diego (Training Station, Aviation Base, and Marine Base)
San Pedro (Submarine and Torpedo Destroyer Base)
San Francisco (Training Station)
Mare Island (Navy Yard and Torpedo Storage)
Astoria, Ore. (Columbia River Submarine and Destroyer Base)
Keyport, Wash. (Torpedo Storage)
Sand Point, King Co., Wash. (Aviation Base)
Bremerton (Puget Sound Navy Yard)
Port Angeles, Wash. (Submarine, Destroyer, Aviation Base)

(2) Pacific Possessions

Alaska—None developed
Hawaiian Island—Pearl Harbor, Oahu
Philippine Islands—Manila, Ologanpo, Cavite
Guam—Marianas or Ladrone Islands
Pago Pago (Tutuila, Samoa).

While the Panama canal is in no sense a naval base or station, it should be included in any such survey as this present one, perhaps because it is in some respects a United States fortification, but more particularly because of its great importance in any Pacific ocean study. Therefore we include Balboa, the Pacific terminus and Crystalbal (Colon) the Atlantic terminus of the Canal.

B. RADIO STATIONS

(1) U. S. Naval Radio Stations

Alaska: St. Paul, St. George,—both on Pribilof Island; ...ch Harbor, Kodiak, Cordova, Sitka (old Russian capital) ...ard, Juneau (American capital), Ketchikan.

(2) U. S. Army

Alaska: Nome, Fort St. Michael, Kotlik, Wrangell, Craig.

(3) Privately Owned

Alaska: Chicago, Port Moller, Libbyville, Latouche, King

(4) Alaska Engineering Commission Anchorage

(5) Other U. S. Radio Stations in the Pacific

(*a*) *Mainland:* Keyport, Wash.; Puget Sound (Bremerton, Wash.); Tatoosh Island, Wash.; North Head, Wash.; Seattle, Wash.; Portland, Ore.; Astoria, Ore.; Marshfield, Ore; Eureka, Cal.; San Francisco, Cal.; Point Arguella, Cal.; San Avalon, Cal.; San Diego, Cal.; and Farrallon Islands (off the coast of San Francisco); Mare Island Navy Yard.

(*b*) *Hawaiian Islands:* Pearl Harbor, Heeia Point; Wahiawa; Lihue Kauai; Kawaihae; Lahaina; Kaunakakai.

(*c*) *Philippine Islands:* Fort Mills (Corregidor Island).

Insular Owned: San Jose (Mindoro); Cuyo; Puerto Princess; Malabang; Davao; Zamboango; Jolo and Cavite.

(*d*) *Other Pacific Possessions:* Samoa (Tutuila); Balbao, C. Z.; Guam (Ladrone Islands).

(*e*) *Peking* ("Courtesy" station within American Legation).

II. Great Britain

A. NAVAL BASES

Canada—Dominion: None developed, but potential at Vancouver, Victoria, Prince Rupert (all British Columbia).

Imperial Stations at Hongkong, Weihaiwei, and Singapore. A naval station of first-class importance is located in Hongkong; one of the greatest navel stations iin Asia is to be developed at Singapore. At the fortified harbor of Aden, Arabia, a port of extraordinary strategic importance, a large coaling station is situated. The harbor of Columbo, Island of Ceylon, in the Indian Ocean, is a protective harbor.

Australasia—Commonwealth of Australia: Sydney is a first-class naval station; headquarters of British Fleet in Australasia. New Zealand: Auckland.

B. RADIO STATIONS

(1) *Canada:* Digby Island (Prince Rupert); Gonzales Hill (Victoria); Point Grey (Vancouver); Cape Lozo; Pachena Point; Estevan Point; Triangle Island; Ikeda Head; Dead Tree Point; and eight private commercial stations of minor size—all in British Columbia.

(2) *Australia:* Port Moresby; Thursday Island; Cooktown; Townsville; Rockhampton; Brisbane; Sydney; Finders Island; Melbourne; Hobart; King Island; Mount Gambier; Adelaide; Esperance; Perth; Geraldton; Broome; Roeburne; Wyndham; Darwin; Samarai; Woodlark Island; Cocos Island. Included with the Australia Radio stations should be listed those of foreign German territory now administered by Australia: Rabual; Madang; Nauru; Kieta; Bita Paka; Morobe; Eitape; Manus; Kaewieng.

(3) *New Zealand:* Auckland; Suva; Labasa; Taveuni; Savusavu; Awanui (Auckland); Awarua; Wellington; Chatham Island; Apia (Samoa); Raratonga (Cook Island).

C. CABLE COMMUNICATIONS

Canada: Bamfield, British Columbia.

Australia: Sydney, Melbourne, Adelaide, Brisbane, Darwin, Fremantle, Cocos Island, Southport, Botany Bay, Burnett Heads.

New Zealand: Auckland, Wakapuaka, Wanganui, Doubtless Bay.

Tasmania: is connected with both Australia and New Zealand by cable.

Fijis: Norfolk Island, Fanning Island stations.

Great Britain also has Cable Stations at Hongkong, Penang, Malacca, Singapore, Sandakan.

III. Japan

A. PORTS AND NAVAL BASES

There are more than a thousand Japanese harbors that are visited by merchant men. Of these there are about sixty harbors open to the call of foreign steamers, which include eleven for Formosa and ten for Korea. Of these sixty, thirteen stand out most prominently from the standpoint of harbor improvements, reclamation or dredging. Of the thousand harbors, three hundred and fifty are used by coast steamers and thirty-six are known as open ports. Two are known as fortified ports and four as naval bases. It is these last six in which we are particularly interested.

The two fortified ports are Shimonoseki and Tsushima. The complete Japanese coastal defense program includes also fortifications to be constructed in the Kii and Bungo Channels, at Amami, Okunawa and Akum—all three in the Lu Chiu Islands archipelago; mine fields in the channel between Sakhalin and Yezo and between Yezo and Nippon; fortification area on the Bonin Islands, and of course Port Arthur and Kiaochow.

The naval bases are those at which the four admiralties have their headquarters: the dock-yards of Yokosuka, Kure, Sasebo and Marizuru. These all possess dry-docks for accommodating was ships. In addition to these Port Arthur possesses a dry-dock but lacks necessary equipment for building war-ships. Two other dock-yards which have built war-ships are the Mitsubishi Ship Yards at Kobe, and also the Osaka Iron Works. In addition to these there are about eight other leading commercial dock-yards.

Tsuruga is a connecting port with Siberia, reconstructed in 1913 at an outlay of Y.800,000.

section of this cable from Tsushima to Fusan was acquired. About this time the work of laying an additional cable between Japan proper and Formosa was completed.

During the Russo-Japanese war Japan laid a cable between Sasebo and Dairen (South Manchuria) and next from Dairen to Chefoo (northern province of Shantung, China). Other cables between Nagasaki and Shanghai and connecting Japan with Siberia are also projected.

Summary of Japan's International Cable Stations

Nagasaki to Shanghai
,, ,, Vladivostok
,, ,, Fusan, via Tsushima
Sasebo ,, Dairen, to Chefu.

IV. China

A. PORTS AND NAVAL BASES

There are forty-eight main treaty ports known as Customs stations in all the provinces in China. Naval docks are located in the Chihli, Shantung and Fukien provinces. Both Nimrod Sound and Santuao are candidates for the chief Chinese naval base.

Naval school, recently reorganized on the British system, are located at Chefu, Nanking, Foochow and Canton.

B. RADIO STATIONS

(1) There are wireless installations at Dairen (Dalny), Hongkong, Peking (Chinese government, American legation, and Italian legation), Port Arthur, Shanghai (Chinese government), Tsingtao, Weihaiwei, Woosung.

(2) *Wireless Telephone.*—On August 24, 1918, a contract was concluded between the Marconi Company and the Chinese government for the supply of two hundred wireless telephone instalments each having a range of forty miles.

B. RADIO STATIONS

Radio Shore Stations	Vibration Metre			Electric Power K. W.		Distance of transmission (naut. mile) Day time	Night time
Funabashi (of the Imperial Navy, for Communication with Hawaii, the largest in the country) ..							
Ochiishi (Hokkaido)	300	600	1,800				
Choshi (Shimosa)	,,	,,	,,	7	(Quenched spark)	600	1,800
Shimizaki (Kii)	,,	,,	,,	30	,,	1,500	3,000
Tsunoshima (Nagato)	,,	,,	,,	3	,,	400	1,100
Osezaki (Hizen)	,,	,,	,,	4	(Ordinary spark)	400	1,100
Shimotsui (Inland Sea)	,,	,,	,,	30	(Quenched spark)	1,500	3,000
Rasa Island (Loochoo)	,,	,,	,,	4	,,	300	1,000
Cape Fuki (Formosa)	,,	300	600	3	,,	450	1,300
Dairen (Kwantung)	,,	,,	,,	4	(Ordinary spark)	450	1,200
				7	,,	500	1,300

Japan is a member of the international wireless union, and regulates the exchange of wireless between these ten coast stations and foreign steamers or between Japanese steamers and the coast stations in foreign countries under rules drawn up based on the principles laid down at the international radio-telegraph convention of Berlin, which regulations were put into effect July, 1919.

C. CABLE COMMUNICATIONS

By agreement made in 1870, Japan conceded to the Great Northern Telegraph Company of Denmark the exclusive right of landing on Japanese territory cables for international service.

Cables were laid between Nagasaki and Shanghai, Nagasaki and Vladivostok, and Nagasaki and Fusan. The cable between Nagasaki and Fusan (leading Korean port) via Tsushima (situated in the Straits between Japan and Korea) was laid in 1882 under charter foe thirty years. Japan purchased the first section of this Nagasaki-Fusan cable as far as Tsushima in 1891. After the annexation of Korea, in October, 1910, to be more exact, the second

C. CABLE COMMUNICATIONS

Telegraph connections have been made with the four cable companies operating in China; with Russia and Japan in respect to the Manchurian telegraph system; with Japan regarding the cables between Dairen and Chefoo, and between Shanghai and Nagasaki; with Germany (now with Japan) in respect to the German cables connecting Shanghai, Tsingtau, Chefoo; with India and France in respect to the communications and the Burmese anñ Indo-Chinese frontiers.

The four cable companies operating in China are—

(1) The Great Northern Telegraph Company Ltd. of Denmark

(2) The Eastern Extension, Australasia and China Telegraph Company, Ltd. British)

(3) The Commercial Pacific Cable Company (American)

(4) The Deutsch-Niederlandische Telegraphen Gesellschaft (German-Dutch).

Main cable offices are at Suikai, Tunghing, Hokow, Cheunnankwan, Manyün, Maimatchen, Tarcheng, Helampo, Hunchun, Shanghai, Chefoo, Tsingtao, Foochow, Amoy and Hongkong.

Vacuum Drying in Modern Industries

By James S. C. Chen, Research Chemist and J. P. Devine Co., Research Laboratory

(Presented at the Seventh National Exposition of Chemical Industries, Sept. 14, 1921, New York City)

THE recent war has exerted a profound influence on the industries of America; among these industries, none perhaps has received a greater impetus than that which deals with the manufacture and refining of organic materials. As the quality of organic products depends in a great measure on the apparatus employed, it is essential that the manufacturer possesses a thorough knowledge of the methods of production and refining, in order that he can supply a superior product to the world market.

James S. C. Chen, B.S.

Vacuum drying, which was used only in limited fields in the past, has in recent years attained a position of such importance in the chemical and allied industries that it is worth while to make a thorough and comprehensive study of the subject. It is the purpose of this article, first, to give an outline of the fundamental principles and advantages of vacuum drying, then to discuss a few types of vacuum drying apparatus, and finally to set forth the result of an investigation as to what extent vacuum drying has been applied to the chemical and allied industries up to the present time, and how it may be advantageously used in other industries which hitherto have never applied vacuum drying in their processes.

(2) That additional heat is required for the molecules to overcome inter-molecular attraction between the moisture and the material.

(3) And, finally, still additional heat is necessary for the molecules to overcome atmospheric pressure.

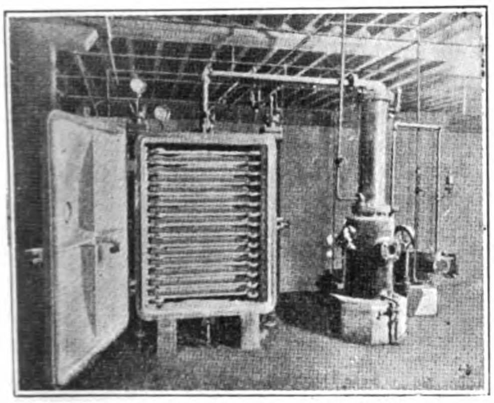
Frequently the heat that is required for the molecules of the moisture to overcome atmospheric pressure is sufficient to cause decomposition of the material. This condition necessitates the the use of vacuum drying. Furthermore, it is a well-known fact that the last trace of moisture is the most difficult to remove from any material; take starch for example:

100 Grams of Dry Starch

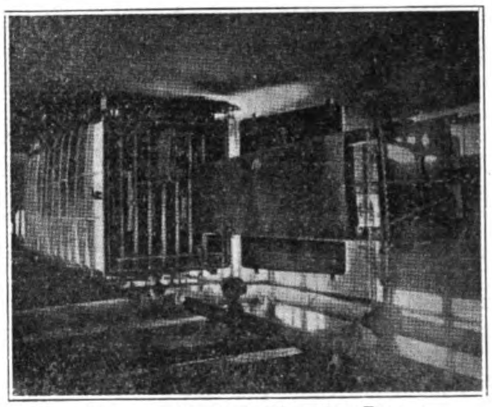
Per cent. of Water	Heat of Imbibition in Calories
.23	28.11
2.39	22.60
6.27	15.17
11.65	8.43
15.68	5.21
19.52	2.91

As a large quantity of heat is produced by a small initial quantity of water, according to the principle of the heat of imbibition, it would require the same quantity of heat to remove the last trace of moisture from the starch. This accounts for the difficulty met in the removal of moisture from organic materials. Vacuum drying is based on the elimination or reducing of the pressure on the surface of the material, and thereby accelerates the rate of evaporation.

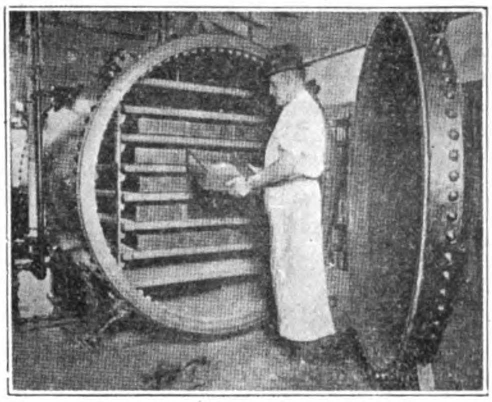
But, if vaccum drying were used only for the aforesaid purposes, its part in the industries would be a limited one indeed. At present



Vacuum Chamber Dryer and Auxiliaries, Figure 1



Vacuum Vertical Chamber Dryer, Figure 2



Vacuum Safety Chamber Dryer, Figure 3

I.

Drying, as it is ordinarily understood, means simply a process of removing moisture from a solid material, but applied to vacuum drying apparatus, it signifies a process of removing moisture or other volatile liquids from a material which may be in the liquid or solid state.

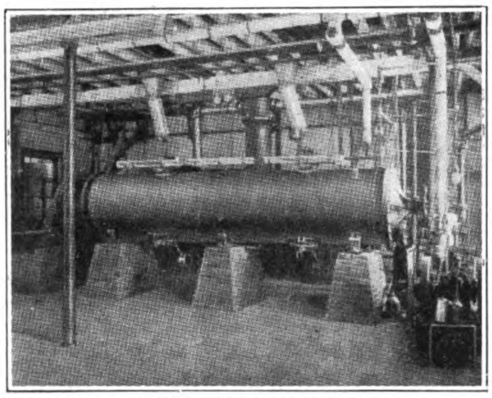
The process of removing moisture from a material depends on supplying enough kinetic energy to the molecules of the moisture by heating. The heat is used for three distinct purposes:

(1) That a definite amount of heat is required to transform the moisture from the liquid to the gaseous phase.

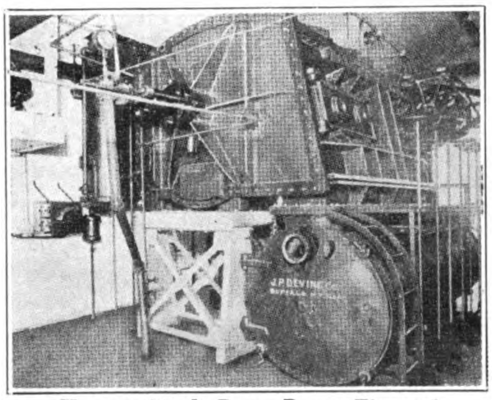
vacuum drying is extensively used in the chemical and allied industries not only because its use is in many instances imperative, but because the process is efficient, economical and insures superior and uniform quality of the finished product.

In the drying of organic substances, oxidation frequently takes place on the surface, which either changes the character of the material entirely, or gives an inferior product by altering the physical appearance.

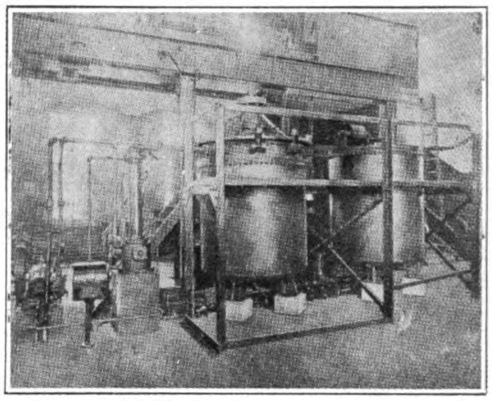
The writer recently demonstrated that the so-called "white sugar" which is marketed in the Far East, is greatly improved by being dried in vacuum, as the major portion of the sugar sold in the Far East is straw colored, which is evidently due to surface



Vaccum Rotary Dryer, Figure 4



Vaccum Single Drum Dryer, Figure 5



Vaccum Impregnating Apparatus, Figure 6

oxidation, and which can be avoided in a proper vacuum drying apparatus.

When materials are not liable to oxidation, their character may be altered, either by overheating, or by long contact with a constant heating surface, as in the case of many drugs and albuminous substances. In the vacuum drying process not only can the heat be controlled to a fraction of a degree, but the contact of the material with the heating surface can be avoided, and when it is necessary for the material to come in contact with the heating surface it can be controlled to a fraction of a minute, thereby preventing the material from deteriorating.

Fire risk attends the drying process in plants of organix industries; this is especially true in the case of smokeless powder and other high explosives. Constant danger demands constant supervision along with enormous cost of labor and frequent damage both to life and property. In the vacuum drying process this danger is minimized, not only because there is no direct heating medium, but the drying can be accomplished at the lowest temperature in the shortest time.

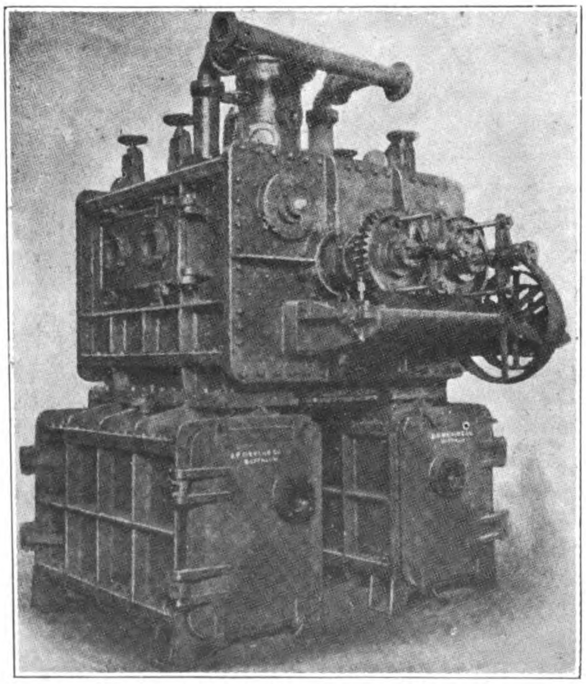
The fact that vacuum drying is independent of climatic conditions presents another distinct advantage. Any experiment or process once determined in vacuum can be accurately repeated. Would it not be a great advance in chemical science and industries, if the boiling point of all organic liquids were determined in a definitely reduced pressure ?

Under certain circumstances vacuum drying is by far the most economical of all drying processes, in that it reduces the drying period and consequently the cost of labor to a minimum. The transmission of heat is exceedingly efficient, due in part to the high vapor pressure of the moisture and in part to the great temperature difference between the material and the heating medium, which in turn gives a high co-efficient of heat transfer. Moreover, exhaust steam or hot water may be utilized to advantage as a heating medium, because drying can be conducted at low temperatures.

Vacuum drying equipment occupies but small floor space, and requires comparatively low cost for its operation. Therefore, plants where vacuum drying has never been used usually can install a vacuum drying unit without fundamental modification of their arrangement.

In the drug and dye industries, valuable solvents are frequently used; these solvents can be completely recovered in the vacuum drying apparatus, which in this instance serves a double purpose.

In other industries, such as rubber, the quantity of solvents used is so great that in order to insure safety and economy the solvents should be completely recovered.



Vaccum Double Drum Dryer, Figure 7

Vacuum drying reduces the cost of transportation; in the past many food products, such as fruits, vegetables and dairy products, could not be advantageously dried without causing damage to their essential character and freshness. Hence, complicated and costly equipment was required for their transportation, which is made unnecessary by the vacuum drying process. When a certain percentage of moisture is desired in the material, its uniform distribution can be accomplished in the simplest manner in the vacuum apparatus.

The world demands a product of superior quality. No industry can long prosper or even survive if it ignores this fundamental point.

Not very long ago the writer personally worked on two entirely isolated drying problems, i.e., whole milk and chrome yellow. The milk that was dried to powdered form by the hot air method was only partly soluble in water at 70° C., while the same milk that was dried in vacuum was entirely soluble at the same temperature, and free from any randicity. But, milk dried by air under atmospheric conditions is noticeably rancid, evidently caused by the oxidation or overheating of the butter fats contained in the milk.

If it is possible to put color in words, this may be said with regard to chrome yellow, that the color of this dye is brighter when it is dried in vacuum than when it is dried in any other way. Further, it is possible by means of drying chrome yellow in vacuum to continually produce the same shade of finished product.

It is the general impression that the initial cost of vacuum drying equipment is too great to recommend it for general use. But, the economy of fuel, time, labor, coupled with the sturdy construction of vacuum drying apparatus and superior product make the use of vacuum drying not only desirable, but necessary, for it is certain that the future world market will be dominated not by the largest quantity but by the best quality of product. While the vacuum process may not be applicable to all drying problems, it certainly merits in each case careful investigation.

II.

Although it has been known for hundreds of years that under constant temperature the rate of evaporation increases as the atmospheric pressure decreases, vacuum drying did not find commercial use until Passburg invented vacuum drying apparatus. The Passburg patents were acquired and introduced into the United States by Mr. Joseph P. Devine of Buffalo, twenty years ago, and it is interesting to notice that by engineering genius and

constant improvement the acquirer excels the inventor in more than one respect in the construction and application of vacuum drying apparatus.

There are as many types of vacuum dryers as there are drying problems ; for the present, four of the most general types of vacuum drying apparatus will be discussed, i.e., the chamber dryer, the rotary dryer, the drum dryer and the vacuum impregnator.

Chamber dryers are of two general types, i.e., the rectangular and the cylindrical. The outer casing of the former is made of cast iron, while that of the latter is made of sheet steel. As the nature of the materials may require, the heating shelves are arranged either horizontally or vertically.

Figure 1 shows a vacuum chamber dryer ; it consists of a heavily ribbed cast iron box in one or more sections ; the doors are also made of cast iron, and attached to the body by double swing hinges. The dryer is made air tight by fitting a rubber ring into the groove on the inside flange, and observation glasses are fitted on the door for inspection and control during the time of drying. heating shelves are made of two rolled steel plates, welded at the edges and separated by spaces flush riveted at regular intervals. The heating shelves can withstand a test pressure of 100 pounds ; they are very carefully made—the plates used for the making of heating shelves are hydraulically straightened, all holes are drilled and countersunk, and manufactured on specially constructed apparatus to insure perfect evenness and rigidity. Each heating shelf has its own independent steam feed and exhaust connections, giving complete drainage and allowing uniform heating. The arrangement of the distance between the heating shelves is a problem in itself, and is determined by the nature of the material to be dried. The principal points to be considered are the tendency of the material to effervesce during the drying process, the sensitiveness of the material to heat, and the height of the bubbles coming from the material caused by local conditions, that is, the temperature of the heating medium and the vacuum.

The capacity of the vacuum chamber dryer is based on the number of square feet of heating surface, which varies from a few square feet to several thousand square feet. The quantity of the vapor given off in a specified time must be taken into consideration in determining the capacity of the vacuum pump and that of the condenser. In order to secure the greatest efficiency of drying the capacity of both the vacuum pump and the condenser should be based on the peak of the load, for it must be remembered from the consideration of the heat of imbibition that other conditions being the same, the rate of evaporation will be the highest at the beginning of the drying, which steadily decreases until the last trace of the moisture is expelled. Should the capacity of the pump or condenser fall below the peak, not only would it be impossible to maintain the vacuum, but chemical reaction might take place between the vapor and the material on account of the rising temperature of the latter.

It is therefore of extreme importance that the capacity of the auxiliaries be calculated to fit the capacity of the vacuum chamber dryer, and what is true of the vaccum chamber dryer may be said for all drying apparatus.

The vacuum chamber dryer is used for drying all materials which can be handled on trays, and which do not need stirring during the process. The trays are made of steel, enamel or other materials, as the nature of the material may demand. The bottom of the tray must be as smooth as possible, so that uniform transmission of heat may be secured. In operation, the heating shelves are first of all heated with hot water or steam, then the vacuum chamber dryer is charged, and finally the vacuum pump is started. The loss of time for loading and unloading a vacuum chamber dryer was heretofore considered an objection, but this is no longer a serious matter on account of the improvement in auxiliaries.

The vacuum chamber dryer with vertical heating shelves, as per figure No. 2, is especially adapted to the drying of fabrics, lumber and felt, and all materials that must be placed in a vertical position during drying.

Figure 3 shows a safety vacuum dryer for the drying of high explosives ; this dryer is equipped with safety valves with ground joints ; the door and rear of the dryer are held to the body of the apparatus by a number of spring devices so that in case of internal explosion the pressure must build up to equal the pressure of the atmosphere, which releases the safety openings and doors, so that the damage is reduced to a minimum. Thus vacuum drying in the case of high explosives is not only the most economical process but the safest.

The rotary vacuum dryer is especially adapted to materials that can be stirred or agitated during drying. This type of apparatus consists of a steam jacketed outer cylinder with an interior rotating heating tube to which is attached adjustable stirring blades of very rigid construction. The materials to be dried are kept in constant motion, bringing new particles of the material in contact with the heating surface, so that the drying time is greatly reduced, and a very much larger quantity can be handled per charge.

When drying a material which has a tendency to coat the heating surface, the apparatus is installed with adjustable scrapers to prevent the coating of the heating surface.

The rotary vacuum dryer can be made continuous in operation, and is by far the most economical type of apparatus for handling granular or powdered materials.

For substances that can readily form a film the vacuum drum dryers are specially useful. There are two general types of vacuum drum dryers, namely, the double and the single.

The single drum dryer consists of an outer cast iron casing, inside of which rotates a hollow drum made of cast iron, bronze, gun metal or other materials. The drum is well balanced, polished and heated internally with hot water or steam, and where high temperatures are necessary, hot oil and even internal combustion may be employed.

The material to be dried is placed on the single drum in various ways ; and the simplest method is to dip the drum into the material which is automatically regulated and kept at a constant level. The ends of the drum are protected by adjustable shield rings, thereby preventing the material from solidifying on them. When working with a material that is delicate and sensitive to heat, the film is placed on the drum by a small feeding-roller. The material is fed from a cooled liquor trough to the feed roller and thence to the large drum. In this way the material does not come in contact with any heating surface before it reaches the drum.

The vacuum double drum dryer is constructed on similar lines to the single drum dryer, and is of more recent development. It consists of two drums rotating in opposite directions, a knife device for the removal of the dried material, and an agitator to prevent the material from solidifying.

The vacuum double drum dryer has great advantages over the single drum dryer, as a larger quantity of material can be handled in a smaller apparatus; semi-liquid as well as liquid materials can be dried in a double drum dryer, and the difficulty of effervescing experienced with any type of single drum dryer, can be overcome in a double drum dryer.

Like the rotary vacuum dryer, both types of vacuum drum dryers are made continuous in operation.

The study of vacuum impregnation is at once fascinating and instructive. The apparatus consists of a liquor tank and a vacuum drying and impregnating chamber, which is steam jacketed. The materials to be impregnated are put in the latter while the former serves as a storage for the compound. The two are connected by steam jacketed pipes so as to prevent the compound from solidifying.

The materials to be impregnated are subjected to drying in the vacuum chamber as in the case of chamber drying, where the air and moisture in the material are rapidly removed. The liquified compound is now drawn into the chamber. On account of the absence of air and moisture the compound immediately penetrates the innermost recesses of the material. To render the pene-

tration of the compound more rapid and thorough, the action of the vacuum pump is reversed, changing it into a compressor, and the combined action of vacuum and pressure results in a uniformly impregnated product in a short time.

Mindful of the fact that it is not possible to do justice to all types of vacuum drying apparatus, it is opportune to investigate just to what extent the foregoing mentioned apparatus have been applied to modern industries.

III

Extensive investigation with regard to the application of vacuum drying to modern industries has disclosed the fact that during the last twenty years, thousands of substances, representing hundreds of industries, hav been successfully dried by the four types of apparatus just discussed. To enumerate them would serve no useful purpose, for in many cases the requirements of the different industries concerning the quality of their products are identical. It is the object, therefore, of this article to give just a few of the leading industries along with some typical substances, in which the use of vacuum drying has proven to be a distinct advance.

I. Food Industries.—The fundamental requirements with regard to drying in food industries is not only the reduction of the bulk of the products whereby the same can be easily transported from place to place, but the conservation of the freshness and the essential qualities of the food articles, such as odor and taste. These conditions can only be successfully met by the vacuum drying apparatus, and the drying of such articles as meats, meat extracts, fish, eggs, milk, vegetables, vegetable extracts, fruits, nuts, cocoa, tea, coffee, chocolates, biscuits, corn, cereals, starches and yeast will speak for themselves.

Fruits and Vegetables.—Weight of dried fruits and vegetables produced from 100-lbs. of green product: Apples, 12.5-lbs.; cherries, 6.6-lbs.; pineapples, 10-lbs.; plums, 33-lbs.; cranberries, 10-lbs.; currents, 14.3-lbs.; huckleberries, 14.3-lbs.; lemons, 14.3-lbs.; oranges, 16-lbs.; beans, 7.1-lbs.; beets, 7.-lbs.; cabbage, 5.5-lbs.; carrots, 7.6-lbs.; cauliflower, 4-lbs.; celery, 5-lbs.; corn (green), 8.3-lbs.; egg plant, 6.3-lbs; leek, 10-lbs.; lima beans, 12.5-lbs.; okra, 12.5-lbs; raisins, 25-lbs; raspberries, 14.3-lbs.; rhubarb, 5-lbs.; peaches, 10-lbs.; strawberries, 5.5-lbs.; parsley, 9-lbs.; parsnip, 20-lbs.; peas, 12-lbs.: potatoes (white), 17-lbs.; potatoes (sweet), 12.5-lbs.; pumpkins, 8.3-lbs.; rhubarb, 5-lbs.; spinach, 7.1-lbs.; tomatoes, 5-lbs; turnips, 6-lbs.

II. Chemical Industries.—The world demands purity of chemicals. This requirement must be met during the process of refining, when the last trace of moisture is to be removed and where contamination, due to the presence of air, metallic contact and overheating are to be avoided. Under these industries we find the successful drying of acetates, organic acids, inorganic salts, aniline salts, beta napthol, alkaline solutions, sulphur lime and white lead.

I. Drug Industries.—There is an upper limit of temperature beyond which many medicinal materials cannot be dried without causing serious decomposition. Further, there is an upper limit of temperature beyond which the intrinsic value of medicinal materials gradually decreases, although their physical properties remain unchanged. Drying in the vacuum the lowest temperature can be employed for the elimination of the included moisture, giving the best quality in such products as blood serums, pepsin, hexamethylenetramine, aspirin and phenacetine.

IV. Dye and Rubber Industries.—In the dye and rubber industries large quantities of valuable solvents are used. With the vacuum apparatus these can be completely recovered. For this purpose vacuum drying apparatus are successfully employed in drying aniline oils, resorcin, organic dyes, dyestuffs, color wood extracts, sulphur black, chrome yellow, rubber, rubber substitutes and reclaimed rubber.

V. Wood and Allied Industries.—The rapid and uniform drying of wood products, sometimes by the use of exhaust steam, makes vacuum drying the most desirable and economical. Uniform impregnation of wood products in the vacuum constitutes another feature that cannot be equalled by other kinds of apparatus. The following have been successfully dried and impregnated:—Timbers, wood products. celluloid, paper, electric apparatus, insulating materials, accumulator plates, magnetic coils and cables.

VI. Leather and Felt Industries.—The drying of leather and finished products requires the complete removal of the moisture without extracting the grease to the surface. This result can be secured quickly in the vacuum drying apparatus, as is evidenced by the successful drying of hides, pig skins, leather, shoes, felt, fur and hats.

VII. Explosive Industries.—The constant danger that attends the drying of high explosives, requires that it be done in the shortest time and at the lowest temperature; and in this connection it is found that the vacuum drying apparatus are the safest and most successful in such plants as smokeless powder, trinitrotoluene, trinitroaniline and ammonium nitrate.

To sum up: (1) That in this article the fundamental principles and advantages of vacuum drying have been clearly outlined, and these advantages would warrant a more extensive application of the vacuum process to drying problems; (2) that a brief discussion of the four more general types of vacuum drying apparatus has been made, in which their unique advantages are pointed out; (3) that the result of an investigation as to the part of vacuum drying in modern industries has been briefly discussed.

It is certain that the discussion of vacuum drying in this article does not aim to be exhaustive; on the contrary, only the first principles are discussed with a view to emphasize the supreme importance of research in modern industries. We need only remind ourselves that we are in an era of great manufacturing activity and keen competition, and that no modern industry can long prosper or even survive without giving constant attention to the improvement of its method of production and refining, and to the quality of its products.

Production and Use of Fluorspar in Japan

Fluorspar is produced in small quantities at Ishikure, in Ise province, and also at Hotatsusan, in Noto province. The domestic product is of such poor quality, however, that the greater part of the demand is supplied from foreign sources, principally Korea, Manchuria and South China. So far as can be ascertained, none is imported from the United States.

The grade used varies from CaF_2 of 50 per cent. quality, secured from Shinmaku, in Korea, to CaF_2 of 80 to 85 per cent., secured from South China. That which grades 80 per cent. or more is generally required in the local steel industry, although the Mitsubishi Co. uses a 50 per cent. grade at the Kenjiho Works. Fluorspar of 65 to 70 per cent. is utilized in the manufacture of glass and enamel ware. A certain amount is utilized at the Kamioka mine of Mitsui & Co. and also at the Osaka Electric Refinery of the Mitsubishi Co. Approximate prices c. i. f. Japanese ports are as follows: Korean, 50 per cent. quality, 12.50 yen per ton; Manchurian and Korean, 65 per cent., 25 yen per ton; South China, 80 to 85 per cent., 50 yen per ton.

The total amount of fluorspar used in the Japanese steel industry during 1920 was 230 metric tons.

Because of the small amount imported, flourspar is not listed separately in the Japanese trade statistics, not has it been possible to secure this information from other sources. It is probable that the total importation for all use will not exceed 300 tons, including the amounts received from Korea. Due to the depression in the steel industry and the competition of near-by producers, who are more favorably situated in regard to transportation costs, prospects are not very encouraging for the importation of the American product.

A Review of Japanese Banking

1. Development of the National Banks

BANKING in the modern sense of the word began in Japan in 1871, when the late Prince Ito returning from the United States where he had been studying business methods, proposed that the Japanese government establish a banking system like that of the national banks of the United States. His proposal was acted upon, and in 1872 the "Regulations Controlling National Banks" were promulgated. But before this first step of the government to establish banking institutions under legal restraints, there were several industries already established which bore some of the functions of the modern bank actively engaged in exchange transactions in Japan. The new regulations put an end to these institutions known as "Tsusho Kaisha" or "Kawase Kaisha" (commercial companies, or money order companies), and there was need of doing away with them so serious were their abuses of the trust reposed in them. The new regulations stated that they were promulgated "for the convenience of the people by the establishment of banks."

Banks established under these new regulations were granted the right of issue. This measure was expected to smooth out existing irregularities in the circulation of money which had been so disastrous under the old system. Actually this result was not achieved, and many abuses of the issue right became apparent, largely because of the incompleteness of the system. Only five banks were established under this law, and they were named in order of establishment the "First Bank" to the "Fifth Bank."

The regulations provided that at least 40 per cent. of the capital of the banks established under its provisions should be held in gold. This reserve was to be the guarantee of repayment of the notes issued. Unfortunately the government was in desperate financial straits, and paper money was issued in reckless fashion, and the difference in value between paper and specie soon became so great that there were "runs" on every bank practically all the time, and things finally got into such a state that the banks were unable to function at all. They were utterly without specie, there was only irredeemable paper money in circulation, and no one had the least confidence in "these banks, or the financial policy of the government behind them."

Things finally came to such a pass that in 1876 the banking regulations were reformed. This time capital was to be 80 per cent. at least, invested in the public loans, and the bonds were to be deposited with the government, which issued against them paper money of equal face value, which the banks put into circulation as loans to business enterprises. The remaining 20 per cent. of bank capital was to be held in gold in the bank's vaults, and not put into circulation. Notes could be redeemed in new notes, there was no obligation of specie redemption.

The immediate result of this change in regulations was to popularize the establishment of national banks. The restrictions on issue were practically all removed, and the result was to increase the amount of paper money in circulation till it became a veritable flood. There were too many banks all issuing notes, and it did not take the government long to see that the condition of affairs was worse than it had ever been before. So in December 1877 the regulations again changed.

The new regulations provided that the amount of the capital of a bank, and the amount of notes is might issue, must be first approved and licensed by the ministry of finance. But this proved an inefficient measure, and it was necessary to change the laws again the following year, 1878. This time the total amount of notes that all the banks might issue was limited to Y.34,420,000 (more or less by a small amount). At that time there were exactly 153 national banks in operation, and their total note issue was about Y.34,000,000. The law provided that no new banks could be established under the national banking laws, and this closed the period of the development of national banks, which had lasted from 1872-1879.

2. Ordinary Banks Spring Up

After 1879 ordinary banks, similar to present day institutions began to make their appearance in the financial organization. Even before 1879 there were a few important companies carrying on such usual banking operations as receiving deposits, making loans and engaging in exchange transactions, notably the Mitsui Gumi Ginko, (Mitsui Association Bank). But under the cloak of the law there was still no place for the activities of these ordinary banks. The first of these "Ordinary Banks" (Futsu-Ginko) was licensed in 1877 when the regulations were changed, by the Mitsui Gumi, under the name of the Mitsui Ginko (Mitsui Bank). Very few other similar banks were established, the National Bank was too popular with investors to attract much notice at that time. In 1879 when the national banks were at the zenith of their prosperity and popularity, the ordinary banks slowly began to appear. In 1880, thirty-nine ordinary banks were established, and in this year the Yokohama Specie Bank was organized.

The Yokohama Specie Bank was organized to assist in effecting some harmonization between foreign and domestic exchange. Foreign trade had been growing year after year, but the awful condition of the national currency was disastrously affecting its steady and healthy progress. In December 1879 the Specie Bank was licensed to begin business with a capital of Y.3,000,000. One million yen of this was deposited with the government in gold, and of the balance of Y.2,000,000, Y.400,000 was deposited in silver, and the rest of the capital Y.1,600,000 was paid up in paper. One of the principal objects of this bank was to keep silver exchange from the violent fluctuations which were disorganizing trade. It was confidently expected that his bank would succeed in bringing about a decrease in the exchange value of silver.

3. Establishment of the Nihon Ginko (Bank of Japan)

During the time between the first authorization of the national banks and the establishment of the first ordinary banks there was a great development of banks in Japan. But banks were really a new kind of business in Japan, and the system authorized by the government was not particularly suitable to Japanese peculiar conditions. The system adopted was only a copy of those abroad, and consequently there were many places where it did not fit into Japanese conditions at all. This was the reason that the issue of paper money was so recklessly increased, and it was only as the great gulf between specie and paper opened wider every day with its detrimental effect on the national commerce that it became evident that something must be done before the nation went to stark ruin. Prices rose, and rates of interest advanced to such a figure that the evils of the time were almost more than the nation could bear.

The government sought about for any suitable means of relieving the situation, and it was the late Prince Ito again who resolved that the only way out of the mess was a complete stoppage of issue of inconvertible notes, and the complete redemption of those then in circulation. Marquis Matsukata who became finance

minister at that time was strongly in favor of this plan of Prince Ito's, and furthered it at every opportunity. In order to assist the government in obtaining its object, it seemed to the financiers of the time that some strong central organ of finance was absolutely essential to the success of the new scheme.

A proposal was accordingly made that a central financial organ be created to (1) smooth out the circulation of money, (2) to supply capital to the national banks, and private companies and (3) to bring about a decrease in the charges made for interest. The plan provided that when the bank was established and in operation it should assume the functions of the department of finance.

The business of discounting foreign trade bills was to be centred in this new bank. On June 27, 1882, the government promulgated the act providing for the establishment of the Nihon Ginko, and at the same time the promoters were appointed. The capital of the bank was fixed at Y.10,000,000, on half of which was to be taken up by the government, the other half open to public subscription. The shares were soon disposed of, and on October 10, 1882, the bank was opened for business.

At the beginning of business the difference between the value of papers and specie was so great that the government did not permit the new bank the right of issue. But the object of the bank being to effect a return to hard money payments the issue of inconvertible notes was gradually restricted, and the regulations governing the national banks reformed, so that eventually the issue of covertible notes was placed in the hands of the Nihon Ginko. Thus in actual use as well as in name, the Nihon Ginko became the centre of the financial world of Japan. The previously existing banks losing their rights of issue were reorganized as ordinary banks and the Nihon Ginko as the real central organ of finance soon began to supply all the funds needed in business.

In 1878 the national banks were permitted to carry on the business of savings banks, but the first known independent savings bank was not organized until 1880.

The Special Banks

In this manner the banking system of Japan was gradually developed, tried out, and adjusted to purely Japanese conditions. The principal purposes of the banks were to supply short term loans to commercial and business houses. Agriculturists and manufacturers and such other persons as required long-term loans found it very difficult to get advances needed for their enterprises. The government took cognizance of this lack in the existing system and in 1896 the Nihon Kangyo Ginko (The Hypothec Bank of Japan) was established by special law, as a semi-official bank, its purpose being to encourage the operations of industry. Co-operating with the Kangyo Ginko, in each prefecture a Noko Ginko (banks of agriculture and industry) was organized. And in this manner the Kangyo Ginko became the centre of credit for the whole nation's industry. It supplies money on long terms to industrial concerns, while the local banks of agriculture and industry lend money to develop special industries in their own localities.

In the Hokkaido industrial conditions are somewhat different from those in Japan, and it was found necessary to develop a special organ of finance for business there. So in 1899 the Hokkaido Takushoku Ginko was organized by law, its object being to encourage colonization in the Hokkaido by offering a means of obtaining funds to develop industries there.

In this manner organs of finance to supply capital to business on the security of immovable properties were developed, and money could be obtained for long terms from them at comparatively low interest. These banks are called the "Fudosan" (immovable property) Ginko, and their special function is to make needed advances of money on immovable property in order to advance the development of agricultural and manufacturing industries.

Now that ordinary commercial transactions and long-term loans were taken care of by special banks organized under official or semi-official auspices, it became apparent that it was also necessary to have some special banks to advance funds on the security of movable properties, and on bonds, and stocks. So in 1902, the Nihon Kogyo Ginko, (Japan Industrial Bank) was established by official order. Its object was to advance money on the security of valuable securities, especially on bonds and stocks. It also specialized in loans for factory building, and it was active in importing foreign capital for use in Japanese industry. It is also the first Japanese bank to undertake a trust business.

After the annexation of Formosa it was soon discovered that a special bank was needed there to handle the ever growing business transactions with the home country. The Bank of Taiwah (Formosan Bank), was accordingly established in 1900. It acts as a bank of issue in Formosa, and handles all the funds of the government general of Taiwan, lends money to individuals and companies, and in general acts as the central financial organ of Formosa. It also assists merchants to extend their operations towards the South, into the South Seas, as the Japanese call the lands lying south of Formosa.

In Korea a bank similar to the Bank of Taiwan was much needed, and in 1909, the government legally organized the Bank of Chosen, as a successor of the Dai Ichi Ginko. This bank is also a bank of issue, and it is the central financial organ of Korea. It keeps the funds of the national treasury, and the government general on deposit, and also carries on private business. Its notes have no connection with the notes of the Bank of Japan.

In the manner described the Japanese banking system has been developed during the past fifty years. Every year its operations become more complete, and its nearness to the heart of the nation's problems is generally acknowledged. Perhaps the system is not free from points of criticism, but the faults are details, and the advantages to the nations's industry are manifest in a thousand telling ways.

Trust Companies in Japan

TOKYO, October 9.—The business of the Trust Company in Japan is not quite so new as might be thought from the seeming absence of such organizations in the economic world. Before the war there were over five hundred companies registered which had the word "Shintaku" meaning "trust or confidence" in their company names, or which stated in their "Objects for Incorporation," that they undertook "trust business." All together, before the war, about Y.40,000,000 were invested in these 500 companies. In Tokyo alone there were 250 trust companies, capitalized at Y.25,000,000.

Nature of Early Companies

These early trust companies undertook the management of estates: the improvement and reclamation of land and buildings; adjustment and management of private property; took charge of investments; settled accounts for companies and private persons; made loans on real property and buildings, or lent money on credit and also acted as loan brokers. On occasions they bought and sold land, and engaged in any kind of commission transactions in commercial goods. Most of them were, however, only a sort of building and loan association, which sold homes on the instalment plan. They also sold bonds and shares on the instalment plan. Many of them acted as trustees and custodians, and some of them were merely bill collectors.

In these many ways these "trust" companies suddenly sprang up all over the place before 1914, and they all seemed to be very active and prosperous. But looked at with a critical eye most of them were really only engaged in selling bonds and shares on monthly instalments, or acted as mutual credit associations. Many of them carried on very fraudulent business indeed, and money entrusted to them for any purpose was squandered recklessly in hopelessly incompetent industries.

There were, of course, everal real trust companies among all these concerns. These companies really acted as loan brokers. They borrowed money from many persons and lent to a favored few. It is very simple to issue loan certificates to many persons for money lent for a seeming purpose, but it is not easy to divide security up amongst the lenders. So loan certificates became popular with such companies, and they held the security for the loans themselves.

The trust companies were responsible for the securities, they approved them, and accepted them, as collateral for issuance of their own loan certificates. This was all very well when there really was care and attention shown to the class of security accepted, but more often than not, the security was valueless, and the borrower was a friend of the trust company. The holders of the loan certificates were calmly swindled out of their money.

Banks as Trust Companies

In 1906, a law was promulgated regulating the operations of companies issuing trust debentures against securities. But the operation of the law was confined to companies with more than Y.1,000,000 capital. Other trust companies with less than one million capital were prohibited from issuing these debentures, and were practically confined to carrying on a sort of banking business. As a matter of fact, before the war the only real trust companies in all Japan were a few of the great banks, the Nippon Kogyo Ginko, the Mitsui Ginko, the Yasuda Ginko, the Dai Hyaku Ginko and the Dai Sanju Shi Ginko. Other companies were only "trust companies" in name, and their business in amount, was more or less than nothing at all, and only a kind of "note-shaving."

War Brings Changes

After the great war, there were many great changes in the economic organization of Japan. Naturally, the trust companies were also affected. Many new industries sprang up in 1919, and they all required capital on long time terms. The banks previously had been able to meet all demands for industrial funds, but the demand after the war was so sudden and so great that the banks were unable to keep up with the demand for long-term loans and still keep mobile funds for commercial transactions. This brought the trust companies into the loan market as supplies of capital, on long-time terms, to budding and promising industrial ventures.

To meet the new demand many new trust companies were organized. The Nichi-Bei Shintaku K.K., the Nissho Shintaku K. K., the Kyosho Shintaku K. K., the Nichiro Shintaku K. K., and many others sprang up to meet the growing needs of the country for long-time loan funds.

The leader in the movement was the Bank of Taiwan, which for a time accepted "deposits on trust," for from three to five years at a higher rate of interest than the banks allowed on fixed deposits. But this was only an episode in the bank's career, and the new trust deposits were soon abandoned after a somewhat inglorious trial.

Among the many trust companies which were organized in the after-the-war boom, the Nichi-Shintaku may be taken as representative of them all. Both these companies are capitalized at Y.50,000,000 each, which is more than the total capitalization of the 50 trust companies organized before the war. From this one fact alone it can be seen what a decided advance has been made in the standing of the trust company's business during the past few years.

These new trust companies undertake all the usual business of trust companies in America and Great Britain, and add to their activities, the guaranteeing of company and personal loans. They also guarantee the rate of dividends on stocks of new companies, but this is also a part of the work of American trust companies. The two great trust companies, the Nichi-Bei Shintaku K. K., and the Kokusai Shintaku K. K., find that the greatest part of their activity is centred around the guaranteeing of loans.

Something Good

The present trust companies are beginning to fill a very definite need in the present economic organization of the country as suppliers of capital which the banks cannot lend for the long time the trust companies can consider. But in this function the trust companies really assist the banks, but even under the best of circumstances some collision of interests between the trust companies and the banks may be expected. They both solicit deposits of funds from the public. There is practically no difference between the deposits in the trust companies and the bank's fixed deposits, but it is easier for the trust companies to make long-term loans.

So, it happens that for some time past the trust companies have been more successful in getting long time deposits than the banks have been. Before the war there was not a single trust company with such an ability, but now the deposits of the Nichibei and Kokusai Shintaku Companies are very large. In order, therefore, to avoid a collision between the banks and the trust compannies, the government should rewrite the laws under which trust companies operate.

New Plan Outlined

Deposits with trust companies partake of the nature of savings deposits. Banks should devote themselves exclusively to short-time current account deposits, and to discount, while trust companies should concern themselves only with long-term loans. Trust company deposits will then assume the character of real fixed deposits, and the deposits in the banks will be only temporary deposits. Banks should lend money for commercial transactions only, while the trust companies should confine their loans to industrial concerns which require long-time terms.

As things are managed in the banks to-day there will soon be a collision between them and the trust companies, so the division of the loan field should be made as soon as possible between their present conflicting interests. In this way the great banks will naturally be obliged to establish co-operating trust companies which will have the confidence of rich capitalists who will deposit their money with them for the development of the industrial organization of the country.

The trust company business in Japan is still only in its swaddling clothes and it remains to be seen what it can do if permitted to go on competing with the banks for long-time deposits. But it is necessary that the law be changed in order to avoid ruinous competition between the banks and the trust companies. The new law should provide for very complete investigation and inspection of the accounts of all trust companies, and their investments and all loans should be strictly controlled by the government.

If these things are provided for in the new law there is no doubt of the future of the trust companies. They will then become a most valuable accession to the economic world which requires a reliable organ through which funds for industrial use can be obtained on terms which banks, with their necessity of keeping their funds mobile, are unable to give without endangering the commercial interests of the nation.

The Thirteen Great Banks of Japan

THIRTEEN banks in Japan carry deposits of over Y.100,000,000 each. Eight of these are in Tokyo and five in Osaka, the former being the Mitsui Bank, Ltd., Dai Ichi Ginko, Ltd., Jugo Ginko, Ltd., Mitsubishi Ginko, Ltd., Kawasaki Ginko, Ltd., Yasuda Ginko, Ltd., Dai San Ginko, Ltd., and the Dai Hyaku Ginko, Ltd., while the Osaka banks are the Sumitomo Ginko, Ltd., 34th Bank, Ltd., Yamaguchi Ginko, Ltd., Omi Ginko, Ltd., and Kajima

Ginko, Ltd. Considering the great amount of their deposits these thirteen institutions may quite reasonably be called the "Great Banks" of Japan.

At the end of June, 1918, deposits in all the banks in Japan totaled Y.3,806,000,000, and by the end of June, 1919, this had increased to Y.5,744,000,000. This amount has not yet been exceeded, and it is doubtful if it will be exceeded in the near future if present unfavorable conditions in the business and industrial worlds continue.

The greater part of Japan's bank deposits is held by the banks forming the membership of the clearing house associations in the great commercial centres, as is clearly shown by the following figures :—

	Total Deposits Whole Country	Deposits in Clearing House Banks
	Yen	Yen
1918, June 30	3,806,533,000	3,496,974,000
Dec. 31	4,639,315,000	4,307,961,000
1919, June 30	5,192,938,000	4,607,067,000
Dec. 31	5,744,097,000	4,975,596,000
1920, June 30	Unknown	4,866,251,000
Dec. 31	Unknown	4,811,190,000
1921, June 30	Unknown	5,101,000,000

(*Note.*—Some of the exchange banks have not reported their deposits of June 30, 1921, so the 1921 figure is an estimate.)

Clearing house associations exist in Tokyo, Osaka, Kobe, Kyoto, Yokohama Nagoya, Hiroshima, Shimonoseki, Moji, Kanazawa, Hakodate, Otaru, Sapporo and Fukuoka, seventeen cities in all, covering every important commercial district from north to south.

On December 31, 1918, about ninety-five per cent. of the bank deposits of the country were held in the clearing house banks, but on December 31, 1919, they held only eighty-seven per cent. By June 30, 1920, their deposits had increased by Y.111,000,000 ; the end of the year showed a decrease of half this amount, but again by June 30, 1921, an increase of Y.290,000,000 had been made in their deposits. These thirteen banks have weathered the panic of 1920 in a manner inspiring the ordinary bank depositor with confidence. As a natural result of this confidence in the clearing house banks their deposits are steadily increasing in the present trying times. The greater part of the deposits shown in the first table are held by the 13 great banks. On Jnne 30, 1919, they held Y.2,934,000,000, on December 31, 1919, Y.2,915,000,000, and on June 30, 1920, about Y.3,000,000,000, out of Y.4,866,251,000, representing the total deposits in all clearing house banks in all Japan. In other words sixty per cent. was held by the Great Thirteen, and they hold more than fifty per cent. of the deposits of the whole country. This is an extraordinary state of affairs.

At the end of June, 1921, the Mitsui Bank carried the largest deposits, and the Dai Hyaku Ginko the smallest of the eight of the Great Thirteen in Tokyo. In Osaka the Sumitomo Bank held the most and the Kajima Bank the least. In order of amounts of deposits held these thirteen institutions rank as follows :—

1. Mitsui Ginko, Ltd.
2. Dai Ichi Ginko, Ltd.(First Bank).
3. Jugo Ginko, Ltd. (Fifteenth Bank).
4. Sumitomo Ginko, Ltd.
5. Mitsubishi Ginko, Ltd.
6. The San Ju Shi Ginko, Ltd. (Thirty-Fourth Bank).
7. Yamaguchi Ginko, Ltd.
8. Kawasaki Ginko, Ltd.
9. Yasuda Ginko, Ltd.
10. Omi Ginko, Ltd.
11. Kajima Ginko, Ltd.
12. Dai San Ginko, Ltd. (Third Bank).
13. Dai Hyaku Ginko, Ltd. (Hundredth Bank).

Deposits in these thirteen banks in Tokyo and Osaka during 1920 and to the end of June, 1921, were as follows :

	June 30, 1920.	Dec. 31, 1920.	June 30. 1921.
Tokyo.	Yen	Yen	Yen
Mtsui Bank	412,188,000	424,702,000	413,194,000
Dai Ichi Ginko	380,134,000	377,363,000	390,356,000
Jugo Ginko	344,099,000	339,609,000	357,885,000
Mitsubishi Ginko	270,100,000	264,550,000	264,550,000
Kawasaki Ginko	161,442,000	165,876,000	173,469,000
Yasuda Ginko	128,877,000	150,174,000	150,228,000
Dai San Ginko	132,460,000	134,916,000	138,902,000
Dai Hyaku Ginko	122,919,000	106,274,000	110,740,000
Total	Y.1,952,215,000	Y.1,963,462,000	Y.1,999,324,000

(*Note.*—The Kawasaki Bank of Kobe, and the Jugo Ginko of Tokyo were amalgamated after July 1, 1920 ; the volume of deposits for June 30, 1920, is therefore their combined deposits on that date. The Mitsuibishi and Sumitomo Banks have not yet published their reports for the first half-year of 1921, so the deposits for December 31, 1920, are repeated in the 1921 column.)

	June 30, 1920.	Dec. 31, 1920.	June 30, 1921.
Osaka.	Yen	Yen	Yen
Sumitomo Ginko	359,764,000	315,441,000	315,441,000
Dai San Ju Shi Ginko	194,457,000	193,677,000	209,523,000
Yamaguchi Ginko	182,860,000	182,221,000	186,685,000
Omi Ginko	125,478,000	132,939,000	145,695,000
Kajima Ginko	119,451,000	127,644,000	140,523,000
Total	Y.981,830,000	Y.951,922,000	Y:995,867,000
Grand Total	Y.2,934,049,000	Y.2,915,384,000	Y.2,995,191,000

Before the war the Dai Hyaku Ginko, Ltd., occupied a position about midway on the list of the great banks, but it has now fallen to the last place on the list.

The greatest deposits in this list are held by the Mitsubishi Bank, Dai Ichi Ginko, Ltd., Jugo Ginko, Ltd., Sumitomo Ginko, Ltd., and Mitsubishi Ginko, Ltd. These are called the "Great Banks" of the first rank. The second rank is composed of the Dai San Ju Shi Ginko, Ltd., Yamaguchi Ginko, Ltd., Kawasaki Ginko, Ltd., Yasuda Ginko, Ltd., Omi Ginko, Ltd., Kajima Ginko, Ltd., Dai San Ginko Ltd., and Dai Hyaku Ginko, Ltd. The lowest deposits total of first rank institutions is that of the Mitsubishi Ginko, and in the second rank the Dai San Ju Shi Ginko comes first. Between the banks of the first and those of the second rank there is a difference in deposits of about Y.60,000,000, so the line may well be drawn where it is. Nevertheless the difference in deposits between the Sumitomo Ginko, the next to the last on the list of the first rank, and the Mitsubishi Ginko, the last on the first rank list, is over Y.50,000,000, so the Mitsubishi Ginko may be said to occupy a position midway between the great banks of the first rank and those of the second rank.

Many factors determine the amount of deposits which these banks carry. All are strongly established in the confidence of the public, and it appears that the amount of each bank's capital, its system of branch offices which tap the resource centres of the country, and the number of its correspondents all have a profound effect on the volume of its deposits. Nevertheless in the present condition of business, and even banking, no great extension of business may be hoped for by increasing capital, or extending branch offices and the number of correspondents of any of these banks. The figures given will show some slight hint of present banking conditions and their potentialities.

Perhaps the outstanding feature is the greater financial importance of Tokyo's banks as compared with those of Osaka. Undoubtedly the capital is the financial centre of Japan, even though Osaka occupies a similar position in respect to the business and industrial life of the Japanese nation.

Defects of Present Banking System of Japan

THE central bank of Japan is the Nihon Ginko, the bank for banks. Its principal function is to regulate the circulation of money. At the same time it is the bank of the nation, it floats the national bond issues, and manages the funds of the national treasury, and has the right of issuing convertible notes. To a certain degree it harmonizes the currency as it is the leader and controller of the financial world. In times of depression or panic it expresses its opinion of the state of the nation, and in times of danger, or alarm it can control business by changing its interest rates. Often when there is a state of reaction in the financial world and private banks show signs of instability the Nihon Ginko will come to its aid, and advance the funds necessary to keep it afloat.

After the war the financial world became very active and eccentricity rules its activities. Speculation filled the thoughts of men and controlled operations in business and finance. In 1919, once in October and again in December, the Bank of Japan raised its interest rate 2 rin a day per hundred yen (about ¾ per cent. a year). This brought the financial world up in its course in great alarm, but the effect of the advance in interest was too slight, and eventually it had little effect on the financial world.

Up to March 1920, business expanded in an unhealthy, unnatural manner, under the driving force of unlimited speculation. The smash came on March 15, 1920, when the share market was obliged to suspend transactions for a few days in order to adjust accounts after a big break in the prices of all shares. The world of finance was not able to recover from this shock, and the great reaction of April, 1920, finally shook the business world almost to pieces. At the time of greatest crisis the Bank of Japan advanced a large part of its frunds on shares, cotton yarn, sugar and raw silk in order to relieve the intolerable conditions the panic revealed. It also deposited some of its funds in other banks and thus enabled them to weather the storm which beat about them. In this way the Bank of Japan faithfully observed its duties as the central bank of the nation. However, it was unable to advance money on company shares, and commercial bills. Its transactions in the panic time were limited to advances on bank security, personal transactions were very few indeeed. Consequently its functions as a central bank are not complete, and its defects were exhibited at the time of the panic.

The special banks, the Yokohama Specie Bank, the Nihon Kangyo Ginko, the Nihon Kogyo Ginko and the Noko Ginko, the Hokkaido Takushoku Ginko, the Taiwan and Chosen Ginko, and the Chosen Shokusan Ginko, all have no connection with the organization and functions of the Nihon Ginko. There is little connection between the government and these banks, although at first glance there seems to be a very close relationship between their activities and the government.

The Kangyo Ginko and the Kogyo Ginko were first established to serve different ends. The Kangyo Ginko was to regulate the supply of funds to the country districts, and to supply capital for industrial enterprises, and to act as a central organ for the Noko Ginko of each prefecture. It made loans against immovable property, and the factories of legal corporations, in the towns and cities.

The Kogyo Ginko was to provide funds for loans against valuable securities, against bonds, and shares. But in recent years it has made its principal business lending money to factories and manufacturing companies. The position of the Kogyo and the Kangyo Banks is thus becoming the same, because they are both acting as organs for providing funds for industrial purposes only.

A recent law permitted the amalgamation of the prefectural Noko Ginko with the Kangyo Ginko, and revised the regulations governing its activities, so that the funds raised by the issues of its premium bonds might only be employed in loans for the public benefit not for individual enterprises. But at the same time it is permitted to make loans on immovable property and on factory equipments, by the issue of ordinary bonds, which, however, are only to be made on city property. In this particular the function of the Kangyo and the Kogyo banks are similar. The Kogyo Ginko does not make loans on country property, and the Kangyo does not lend money on bonds and shares. In this alone are they different.

In recent years a supply of funds for industrial purposes has become more and more necessary, so the Kangyo Ginko and the Kogyo Ginko have in great part adopted the same course of business. In fact there is no reason for not making their business one: perhaps this will be the next advance in the Japanese banking system.

The Banks of Chosen and Taiwan

These banks were established because the conditions of money circulation in the colonies were very different from what they were in the home country. Another reason for their establishment is found in the government's fear that the circulation of the notes of the Bank of Japan in the colonies would not be unattended with anxieties, in the existing state of feeling towards Japanese annexation.

To-day conditions have materially altered. In the beginnings of Japanese occupation business conditions were unsettled, now they are stabilized, and the notes of the Bank of Japan are as well known as the notes of the native banks. The arguments that the nation would sustain great loss in the event of rebellion no longer hold good when rebellion is unthinkable, and the right of issue held by the Banks of Chosen and Taiwan is now a remnant of times gone past. The right of issue held by the colonial banks no longer being essential to the development of the colonies the government is preparing to rescind the right and replace the notes in circulation with those of the Nihon Bank. Of course, business conditions in Taiwan and in Chosen, do not always follow along with conditions in Japan, so it is a real convenience to have the Banks of Taiwan and of Chosen. But the right of issue is no longer necessary to them, and it should be withdrawn. The best solution of the issue right would be to amalgamate thJ two colonial banks into one central colonial bank with close connection with the Bank of Japan.

The Futsu Ginko

These banks have developed well without any protection or assistance from the government. But if one is to speak of the weak point of the banking system of Japan, it is to be found in the too great number of small "futsu Ginko" which constitute a real peril to the Japanese financial world. There is no connection between them, and when conditions of finance are good they lend money in a most extravagant careless manner on any kind of security, and so when conditions get a bit upset, or tight, they feverishly call in their loans, and consequently they contribute to make the waves of prosperity and loss vary too greatly in either direction. This is the greatest evil confronting the Japanese banking world, and it is caused by the mass of little banks which do not act together with the nation's great banks to maintain a normal level of prosperity.

Another great evil is that these small bankers are devoid of any settled opinion about money matters. This present big reaction is largely due to the action of these irresponsible bankers. The recent tendency to amalgamate the minor banking interests is a decidedly good one, which should advance the power and influence of the important bankers, and help to stabilize the opinion of Japanese finance in the eyes of the rest of the world.

Japan's Chartered Company

WHEN Japan undertook the task of developing Korea its government followed the precedent created by Great Britain and organized a semi-official chartered company to carry out the work. The Oriental Development Company, Ltd., was established in December, 1908, with a capital of Y.10,000,000, of which Y.3,000,000 was taken up by the government, its statutes providing rigid official supervision over its operation. The government furthermore furnished a subsidy of Y.300,000 for each of the first eight years, which is to be repaid out of excess profits when dividends exceed ten per cent.

The company started work early in 1909, not long before the formal incorporation of Korea in the Japanese empire, an event which doubtless accelerated the company's progress. The program of the undertaking was largely that of a bank making advances to settlers, to groups of farmers and on produce on the way to market. All such loans were repayable by instalments extending over various terms of years — in the case of produce within one year. Loans could also be made on real property, railways and mining concessions, to public corporations and industrial associations, and on the security of shares and debentures of companies engaged in dealing with emigrants, and in development work. Up to 1916, when the company confined its operations to Korea, the average amount of the loans made was small, and, indeed, had a declining tendency, the average falling from Y.5,835 in 1912 to Y.2,803 four years later.

Offices of Oriental Development Company at Seoul, Korea

Then came a revolutionary change in the scope of the Oriental Development Company, for in 1917 the statutes were revised to permit operations in foreign countries. Branches were opened at Mukden and Dairen in that year ; in 1919 Kharbin and Tsingtao (formerly German) saw branches established. The company contemplates, if it has not already done so, the establishment of branches in some of the South Sea islands and in New York. The Philippines, Sumatra, Java, Borneo and even New Guinea are included in its potential sphere of operations. A curious fact emerges from the record of the company's achievements recently published in English at Tokyo. Under the influence of war demand for products the average of loans in Korea expanded, but still was modest in comparison with those made in the more distant spheres of operations. In 1917 four-fifths of the loans were made in Korea with an average per loan of Y.4,000, but the Mukden branch had an average of 18,300 and the Dalny (Port Arthur) branch one of Y.8,860. By 1918 the aggregate of loans in Korea had fallen to 56 per cent. of the total advances, and their average was just under Y.5,000, against Y.26,600 for Mukden and Y.8,700 for Dalny.

By 1919 the operations had so far changed their character that of Y.70,257,000 advanced only Y.32,595,500 were lent in Korea, where the average loan had declined to Y.4,700, against Y.37,200 for the Mukden branch, 15,500 for Dalny, 54,500 for Kharbin and 52,600 for Tsingtao. Nine loans attributed to the Tokyo head office give an average of Y.336,800 per loan, Agricultural development still claimed the largest proportion of the 1919 loans, though mining and industries begin to bulk more largely, and transport and communications account for a rapidly expanding sum. It may be presumed that the substantial amount of Y.19,806,200, described as for "streets laying," relates to roads, otherwise it would appear that an organization designed for rural development was paying too much attention to urban facilities. In any case it is evident that the company originally intended to fulfil the duty of assisting production in Korea has increasingly become an instrument for developments in Manchuria, Mongolia and China, which since Europe went to war have had to depend more and more on Japanese capital and enterprise for their advancement.

The extent of lands in Korea in possession of the company which is regarded as constituting its most important asset is 278,000 *chobu* and upwards. It consists of paddy fields for 51,150 *chobu*, upland farm for 20,145 *chobu*, forests for 3,873 *chobu*, residential land for 107,700 *chobu* and lands unclassified for 3,331 *chobu*. Besides the company holds on lease state forests for more than 30,000 *chobu*, the ownership of which is to fall into the hands of the company gratis when it has succeeded in the afforestation. The actual value of all these lands must be not less than Y.70,000,000. Besides, since last year the company has acquired lands and buildings to a considerable extent in China. To give the principal instances, it purchased lands and buildings worth Y.1,700,000 in Tsingtao which had been in the possession of Germans under the control of the Chinese government. With these new acquirements the company started an industrial concern. In Tientsin it purchased similar real estate to the value of Y.700,000 and upwards and opened a sister company therewith. In the same place, or Tientsin the company is to shortly purchase another land and buildings amounting to Y.800,000, approximately.

Japanese Life Insurance Business

AT the end of June, 1921, Japanese life insurance companies had outstanding 3,920,000 policies, for insurance amounting to Y.2,873,000,000. Compared to 1913 the number of policies has increased 200 per cent. and the value of the insurance issued, three hundred per cent.

The course of the life insurance business since 1913 (3) is shown in the following table :—

	Policies Issued.	Insurance Value. Yen
1913	1,688,683	963,311,000
1914	1,862,369	1,085,083,000
1915	1,816,239	1,072,225,000
1916	1,849,725	1,130,344,000
1917	2,355,365	1,366,394,000
1918	2,740,100	1,679,605,000
1919	3,328,134	2,222,126,000
1920	3,753,747	2,684,188,000
1921, June 30 ..	3,920,000	2,873,218,000

The Japanese people were slow in grasping the value of life insurance when it was first introduced to them. During the years under review, however, the constant efforts of the established life insurance companies, and a growth of the idea that the companies were reliable and actually would perform the promises they made,

stimulated activity in life insurance circles, and the number and value of policies issued has most noticeably increased year after year.

Principally important is the increase in insurance issued, during and after the great war, as an effect of the good conditions existing in the financial world. The growth was able to withstand even the panic shock of 1920, and business was but little affected by the depression. However, the influence of the panic is now slowly being felt in a general inactivity in life insurance, particularly noticeable from the number of policies which have been allowed to lapse during the past year.

During the first half of 1920 when the effect of the panic was most severe, 80,000 policies valued at Y.57,000,000 were allowed to lapse. In the second half-year, when things were slowly settling down after the great shake-up, 177 policies valued at $140,000,000 lapsed; a total for the year of 257,000 policies valued at Y.197,-900,000.

This year during the period from January 1st to June 30th, 136,000 policies valued at Y.117,681,000 have already lapsed. This is a very large number, particularly noticeable as such when it is considered that adjustments of policies are made on the company's books at the end of the year, and consequently it may be expected that from July to the end of this year the number of lapsed policies will be much greater than during the first half already reported. Bad financial and industrial conditions are gradually making themselves felt in a gradual oppression of all walks of life in Japan, and life insurance is no exception to the rule, for its figures of business show the condition most pointedly.

During the past seven years the number of policies which have lapsed and their value, is shown in the following table :—

	No. of policies lapsed.	Value of policies lapsed. Yen
1915	294,118	192,874,000
1916	249,252	161,171,000
1917	189,392	129,541,000
1918	156,434	112,242,000
1919	154,752	122,350,000
1920	257,614	197,936,000
1921, June 30 ..	136,639	117,681,000

Naturally, with so many policies lapsing the life insurance companies are obliged to put forth unusual efforts to hold up the amount of business they carry.

New contracts issued during the last seven years were :—

	New Policies.	New Insurance Issued. Yen
1915	267,267	191,840,000
1916	301,583	229,799,000
1917	379,409	300,783,000
1918	488,394	412,278,000
1919	666,209	613,534,000
1920	725,955	685,756,000
1921, June 30 ..	312,776	314,514,000

Under the necessity of increasing their efforts to get new insurance all the companies have been obliged to increase their advertising expenses, and the cost of soliciting has also greatly increased during the past two years. It is not at all easy to decrease these expenses because of the loss of new business it would entail, consequently under conditions existing in the financial and industrial worlds the future of life insurance companies is not considered to be very bright.

Last year, from January to June, the average face value of each new policy issued, was Y.1,006. All the companies are seeking large policy-holders, because it costs them no more to sell large amounts of insurance in one policy than it does to sell a policy for a small sum. But the large policy-holders are allowing their insurance to lapse, and the companies are finding it increasingly difficult to get such insurance. About the largest amount of insurance written by any Japanese company on the life of one man is Y.600,000. There are many policies of Y.100,000 and Y.150,000, written on the lives of some of the most prominent business men of Japan. But compared with the use of life insurance by the big business men of the United States, that particular phase of life insurance in Japan is still in its swaddling clothes.

Since 1916 the government's insurance without physical examination, "kani hoken," has increased the amount for which the average company policy is issued. The government's maximum policy is for Y.250. Premiums are very low, and are payable monthly, and the result has been to take practically all insurance for petty amounts away from the insurance companies, who are not unwilling to see it leave them.

Since 1916, the companies have been able to turn their attention to large amount policies. During the last five years the value of single policies issued has therefore greatly increased. Recently, however, the number of big policies has greatly decreased, as a result of the panic, but even with this set-back the average amount of each policy has increased.

The average value of lapsed policies this year was Y.861, which is a hundred yen greater per policy than last year. Many policies for big amounts have been allowed to lapse during the past nine months, which have been months of the greatest strain and anxiety to many prominent business men and financiers, whom only the direst necessity could have driven to this desperate means of cutting down expenses.

The average value of new policies issued and the average value of policies lapsed for the past seven years are shown in the following table :—

	Average New Policies Yen	Average Lapsed Policies. Yen
1915	718.00	651.00
1916	762.00	647.00
1917	793.00	684.00
1918	829.00	718.00
1919	922.00	791.00
1920	945.00	769.00
1921, June 30 ..	1,006.00	861.00

When the effects of the panic began to be felt in the life insurance world many companies began to reduce their staffs and discharge solicitors. But they are now beginning to regret their scary attitude. Those companies who continued strenuous efforts to get business have been those which have written the most insurance during the past six months, while many companies of previous high standing have lost so much business from lapses and failures to get new policies that their position is highly endangered to-day.

Small companies not particularly active before the panic broke were the most badly hit by the slump. But the big companies have now all gone through the re-adjustment period up to date with colors still flying, even if for some of them those colors are slightly bedraggled.

The latest statistics concerning China's mineral output show that, while that country covers about 7 per cent. of the earth's surface, and has a population equal to a quarter of the whole globe, the mineral production is less than 1 per cent. Out of thirty-two substances enumerated, only antimony and tungsten are above 10 per cent.; tin and mercury above 5 per cent.; zinc, arsenic, coal, asbestos, magnesite and talc above 1 per cent. Substances of fundamental importance to national industry, such as iron, copper, petroleum and sulphur are very insignificant in amount, whilst phosphates, nitrates and potash, so necessary to modern agriculture, have not yet been found in any quantity.

Banking in Korea

By T. HOSHINO

FINANCIAL reforms in Chosen began with the engagement by the Korean government in 1904 of a Japanese financial adviser, and, in a strict sense, may be said to have been finished only with the recent completion of the land surveying work which furnished the government with a true and reliable basis for the taxation of land, which tax constitutes the greatest item of the Korean revenue. Meanwhile Chosen proved no light burden upon the treasury of Japan. During the protectorate régimé large sums of money were defrayed by the imperial treasury of Japan for the maintenance of the residency-general and its affiliated offices, railways, postal, telegraphic and other communication facilities, etc., in addition to naval and military expenses, and the meeting of the deficit in the annual revenue of the Korean government. With the transfer of judicial administration and prisons to the Japanese government in 1909, the maintenance of the law courts and prisons also devolved upon the imperial treasury. The sums thus disbursed by Japan were Y.27,000,000 for the fiscal year 1907, Y.31,000,000 for 1908, Y.21,000,000 for 1909 and Y.25,000,000 for 1910, the last-named including expenses incidental on the annexation. With the annexation the complex system of government was changed into a simpler and more unified one, thus curtailing administrative expenses. A special account of the government-general was established, and by it all government expenses in Chosen were to be met by taxes and receipts collected in the country, and the deficit, if any, made good by the imperial treasury of Japan. During the ten years following there has always been some deficit to be made good by Japan, but so satisfactory has been the progress made in the public finances of Chosen that in a few years no subsidy will be needed to make both ends meet. The satisfactory development of the finances of Chosen will be made clear by the following table, in which the estimates of revenue and expenditure for the past ten years are compared :—

Year	Revenue: Ordinary Yen	Revenue: Extraordinary Yen	Revenue: Total Yen
1910-11	11,953,272	10,368,475	22,321,747
1911-12	25,564,176	26,720,288	52,284,464
1912-13	28,764,740	33,362,154	62,126,894
1913-14	31,347,543	31,745,944	63,093,487
1914-15	35,692,238	26,355,422	62,047,660
1915-16	38,829,330	23,893,165	62,722,495
1916-17	44,764,559	23,437,548	68,202,107
1917-18	46,433,567	28,469,829	74,903,396
1918-19	42,668,220	22,473,433	65,141,653
1919-20	52,642,608	24,918,082	77,560,690

Year	Expenditure: Ordinary Yen	Expenditure: Extra-ordinary Yen	Expenditure: Total Yen	Subsidy from Japan Yen
1910-11	9,916,993	8,340,390	18,257,383	2,885,000
1911-12	25,561,053	20,611,257	46,172,310	12,350,000
1912-13	28,000,278	23,780,946	51,781,224	12,350,000
1913-14	31,690,220	21,764,264	53,454,484	10,000,000
1914-15	32,277,749	22,822,085	55,099,834	9,000,000
1915-16	34,724,853	22,145,094	56,869,947	8,000,000
1916-17	36,188,619	21,374,091	57,562,710	7,000,000
1917-18	31,944,360	19,227,466	51,171,826	5,000,000
1918-19	36,399,704	28,741,949	65,141,653	3,000,000
1919-20	39,698,250	37,862,440	77,560,690	?

Expansion of Financial Market.—Along with the commercial and tradal expansion, the financial market of the peninsula has also greatly broadened. Its relation with Japan has become inseparable, and that with Manchuria is constantly growing closer. Every fluctuation in the money market in Japan is reflected in that of the peninsula, and money is moving with the utmost freedom between the two countries. This is quite natural, since most of the large commercial banks doing business in the peninsula are branches of Japanese banks with the exception of the Bank of Chosen, which, on the other hand, maintains four branches in Japan and transacts a very large business through them, as we shall see later on. On the whole, however, capital comes from across the channel, the truth of which statement may be gathered from the various tables given in the preceding chapter respecting Japanese enterprises in the peninsula, and this influx of capital will increase as the financial power of Japan grows and the natural resources of the peninsula become known to the capitalists at home. The financial relation of the country with Manchuria is the reverse of that with Japan. Money flows out to that country to help develop the great natural wealth it has in store. The chief intermediary in this movement of capital is the Bank of Chosen. In a word, the Bank of Chosen introduces capital from Japan, invests part in Chosen, and employs the rest in Manchuria. The Oriental Development Company, which, though it removed its head office to Tokyo a few months ago, may still be called a Korean company, is pursuing much the same line though on a smaller scale. A large number of other institutions and individual merchants keep offices in both countries, and the ever-increasing business transactions between the two countries are uniting the money markets of both into one great economic community. The fact is the Yalu does not separate the Japanese empire and the Chinese republic so effectively economically as it does politically. To the enterprising, Chosen has proved too small a field, they push on to Manchuria and build up there an economic tie, the like of which is rarely found between two distinct self-governing nations. There is no question either that the prevalence of the Bank of Chosen notes outside the boundaries of Chosen, especially in Manchuria, has contributed to no small extent to this broadening of Chosen's financial relation abroad. In connection with this financial inter-relationship between Chosen, Manchuria and Japan, the following table, giving deposits and advances by the Bank of Chosen in the three countries, will be interesting :—

Year	Chosen Offices Yen	Index No.	Manchurian Offices Yen	Index No.
1910	5,470,415	100	442,516	100
1911	5,905,463	108	471,231	106
1912	13,244,707	242	797,938	182
1913	18,650,968	341	749,156	169
1914	16,055,199	294	1,063,626	240
1915	15,781,898	289	2,084,639	471
1916	17,288,089	316	9,107,316	2,058
1917	20,923,336	382	12,338,345	2,788
1918	31,830,760	582	31,569,073	7,156
1919	38,058,360	696	44,555,475	10,069

Year	Japanese Offices Yen	Index Number	Total Yen	Index No.
1910	47,720	100	5,960,651	100
1911	601,587	1,261	6,978,281	117
1912	127,233	267	14,169,878	238
1913	1,401,802	2,938	20,801,926	349
1914	479,679	1,005	17,598,504	259
1915	722,063	1,513	18,588,600	312
1916	6,638,003	13,910	33,033,408	554
1917	54,690,047	114,606	87,951,726	1,475
1918	146,507,508	307,015	209,907,341	3,521
1919	88,069,490	184,555	170,683,325	2,863

Year	Chosen Offices Yen	Index No.	Manchurian Offices Yen	Index No.
1910	20,125,422	100	134,294	100
1911	20,936,352	104	126,576	94
1912	30,932,585	153	277,216	206

Year	Chosen Offices	Index No.	Manchurian Offices	Index No.
	Yen		Yen	
1913	32,369,242	161	2,550,531	1,899
1914	31,748,900	158	3,308,004	2,463
1915	30,210,422	150	3,681,808	2,744
1916	35,650,426	177	17,010,279	12,665
1917	49,445,650	246	24,299,701	18,094
1918	65,579,266	329	70,640,308	52,601
1919	121,228,886	602	115,760,106	86,199

Year	Japanese Offices	Index No.	Total	Index No.
	Yen		Yen	
1910	1,778,572	100	22,038,288	100
1911	834,682	47	21,897,610	99
1912	1,296,590	73	32,506,391	148
1913	2,612,884	147	37,532,657	170
1914	2,019,109	114	37,076,013	168
1915	8,970,271	505	42,862,501	194
1916	8,968,696	504	61,629,401	280
1917	51,164,429	2,882	124,909,780	567
1918	136,546,846	7,677	272,766,423	1,238
1919	157,159,034	8,382	394,148,026	1,788

Expansion of Currency.—The financial market of Chosen has greatly enlarged its sphere of late, the proof of which may be seen in the volume of currencies in circulation, and the amount of the cheques cleared through the four clearing-houses in the country. The increase in the currency is shown in the following table :

Year	Japanese Currency	Bank of Chosen Notes*	Korean Coins: New Coins	Korean Coins: *Yupchun*	Total	Index No.
	Yen	Yen	Yen	Yen	Yen	
1910 ...	553,476	20,163,900	8,215,785	2,415,288	31,348,459	100
1911 ...	3,619,792	25,006,540	4,947,826	1,573,167	35,147,325	112
1912 ...	4,536,528	25,550,400	3,998,036	1,099,700	35,184,664	112
1913 ...	4,438,167	25,693,260	3,020,124	663,266	33,814,817	107
1914 ...	5,056,221	21,850,370	2,318,233	379,916	29,504,740	94
1915 ...	5,457,359	34,387,520	2,028,848	212,631	42,086,358	134
1916 ...	5,490,386	46,627,080	1,913,320	132,971	54,163,757	173
1917 ...	6,219,125	67,364,950	1,905,099	119,522	75,603,696	241
1918 ...	8,417,610	115,523,671	1,904,305	118,078	125,957,664	401

Remarks : * This being the total issue of the note part is in circulation in Manchuria.

The fluctuations noticeable in the table have been due to a great variety of causes ; at one time the import-excess, mentioned before, greatly contracted the currency, while, at other times, especially during the past few years, wartime conditions greatly inflated it. On the whole, however, the currency has expanded through the economic development of the country, which fact is further shown by the amount of the cheques cleared through the clearing-houses in Seoul, Fusan, Chemulpo and Pyeng-yang, the only clearing-houses as yet in the country.

Year	Seoul: No. of Cheques	Seoul: Amount Cleared	Chemulpo: No. of Cheques	Chemulpo: Amount Cleared
		1,000 yen		1,000 yen
1910	59,416	20,490	—	—
1911	167,050	50,527	21,921	9,413
1912	217,727	63,623	26,702	13,698
1913	260,212	64,533	35,413	15,126
1914	284,396	57,331	40,126	13,740
1915	307,061	57,912	42,849	15,874
1916	392,098	81,946	43,613	21,082
1917	490,788	125,960	49,054	32,275
1918	668,398	247,701	57,032	45,435
1919	862,579	572,230	79,427	108,020

Year	Fusan: No. of Cheques	Fusan: Amount Cleared	Pyengyang: No. of Cheques	Pyengyang: Amount Cleared	Total: No. of Cheques	Total: Amount Cleared
		1,000 yen		1,000 yen		1,000 yen
1910 ...	—	—	—	—	59,416	20,490
1911 ...	58,953	12,615	—	—	247,924	72,555
1912 ...	87,510	21,168	—	—	331,939	98,489
1913 ...	111,801	21,621	—	—	407,426	101,280
1914 ...	109,676	19,762	—	—	434,198	90,833
1915 ...	118,100	24,963	—	—	468,010	98,749
1916 ...	133,323	29,898	—	—	569,034	132,926
1917 ...	151,095	44,671	—	—	960,937	202,906
1918 ...	188,497	90,831	82,705	28,504	996,232	412,673
1919 ...	279,934	216,561	120,194	65,596	1,342,134	962,408

Banking Development in General.—With the establishment of the Bank of Chosen all the makeshift measures for banking purposes adopted during the transitory period were done away with, and the peninsula came to enjoy a banking system the same as that of Japan and similar to the one prevailing in the most advanced countries in the world. The currency reform also was all but completed by that time, and the Bank of Chosen notes, the legal tender, had pushed their way into the remotest corner of the country along with the subsidiary coins, which speedily replaced the old ones. The presence of a central bank to regulate and control the financial market as such, and the uniformity of coinage reducing the speculative element in banking operations to a minimum, have of themselves been a great incentive to the development of some banking enterprises. The Japanese banks with branches in Chosen now found themselves in a position to employ their ample resources with much greater freedom and safety and accordingly began to extend their operations. The agricultural and industrial banks, the working of which left much to be desired in spite of their recent foundation, were given active assistance by the newly created central bank, and greatly improved their condition, while the native banks, once on the verge of bankruptcy, regained their vitality and began to show much activity in their own small ways. Some new institutions were also established in the meantime. But the greater part taken in the banking development of Chosen in recent years was that by the central bank itself. Unlike most central banks in the world, the Bank of Chosen is not yet in a position to rest content with the mere rediscounting of bankers' bills. Banks are scarce, so operations performed in most other countries by ordinary banks are in this country performed by the central bank, consequently the development of the Bank of Chosen may be construed not only as the development of a central bank as such but also as the development of the ordinary banking business in Chosen. In the following table is given the balance sheet of all the banks in Chosen combined, including the Bank of Chosen, for the past ten years :—

COMBINED BALANCE SHEET OF ALL BANKS IN CHOSEN

Year	Capital Paid-up & Reserve Fund	Notes Issued	Agricultural Debentures	Deposits
	Yen	Yen	Yen	Yen
1910... ...	7,442,355	20,163,900	990,000	23,829,582
1911... ...	10,987,093	25,006,540	1,870,000	20,064,627
1912... ...	15,556,066	25,550,400	1,780,000	27,837,579
1913... ...	16,806,267	25,693,260	2,990,000	34,436,956
1914... ...	19,681,359	21,850,370	2,910,000	32,320,537
1915... ...	19,911,037	34,387,520	2,319,500	35,626,790
1916... ...	19,165,115	46,733,350*	1,739,000	43,716,742
1917... ...	26,189,543	68,198,369*	3,000,000	53,912,055
1918... ...	41,860,060	116,608,460*	3,000,000	84,647,493
1919... ...	66,511,500	165,299,149*	17,500,000	125,265,571

Year	Government Account	Loans and Bills Payable	Due to Other Banks, etc.	Total
	Yen	Yen	Yen	Yen
1910... ...	2,772,250	3,822,870	3,151,546	62,172,509
1911... ...	2,609,777	9,531,510	3,094,438	73,163,985
1912... ...	3,221,676	9,063,251	5,936,931	88,945,909
1913... ...	3,055,596	9,674,602	4,930,893	97,587,576
1914... ...	3,027,557	12,996,755	4,857,173	97,643,752
1915... ...	3,009,517	8,684,769	5,908,148	109,847,282
1916... ...	2,991,477	8,695,258	7,430,568	130,471,511
1917... ...	2,937,437	16,050,807	10,099,890	180,388,104
1918... ...	2,919,397	21,105,026	16,292,858	286,433,296
1919... ...	2,909,397	38,813,184	28,771,697	445,070,499

*These figures include " Fractional Notes."

Year	Cash in Hand	Money at Call, Bullion, etc.	Bills Discounted and Advances	Investments
	Yen	Yen	Yen	Yen
1910... ...	9,452,255	1,587,623	41,057,255	2,036,735
1911... ...	9,436,781	2,883,426	42,610,753	6,366,007
1912... ...	6,708,251	2,583,360	58,070,479	6,855,202
1913... ...	5,292,536	2,198,378	62,497,923	8,820,418
1914... ...	7,514,325	2,032,447	61,134,526	9,069,872
1915... ...	11,879,528	2,907,166	60,554,756	9,790,775
1916... ...	17,378,733	2,698,007	69,364,977	12,936,239
1917... ...	27,290,904	5,809,480	96,166,298	20,149,772
1918... ...	44,540,036	4,423,253	140,338,617	21,633,509
1919... ...	39,750,585	30,045,098	270,647,755	20,007,154

Year	Due from Other Banks	Bank Premises, etc.	Total
	Yen	Yen	Yen
1910	2,150,997	5,887,649	62,172,509
1911	864,838	11,002,179	73,163,985
1912	770,792	13,957,817	88,945,909
1913	957,932	17,820,386	97,587,576
1914	599,533	17,293,046	97,643,752
1915	1,132,281	23,582,773	109,847,282
1916	1,480,534	26,613,018	130,471,511
1917	1,973,412	28,998,235	180,388,104
1918	6,077,915	69,419,964	286,433,296
1919	5,727,750	78,892,153	445,070,499

Development of Commercial Bank.—In one sense, the Bank of Chosen is the largest commercial bank in Chosen, but it will be dealt with separately on account of its unique character as the central bank. Outside that bank, commercial operations are most largely carried on by the branches of Japanese banks, the most important of which are the Dai Ichi, the Hyaku-sanju and the Juhachi. The history of these branch banks goes far back into the days of the old régimé, and that of the Dai Ichi Ginko has already been given. To the credit of these banks it may be said that it was due to a large extent to their untiring efforts that anything like banking credit existed in those troubled days of old. The Dai Ichi Ginko is the most important of these, and although its one time importance as the *de facto* central bank of Chosen has long since vanished, it still occupies a place in the peninsular financial world next only to the Bank of Chosen. Three native banks, the Hansung, the Chosen Commercial and the Han-il, have also developed into small yet sound institutions indispensable to native merchants. Further, a new leaf has been turned of late in native banking history by the establishment by the Hansung Bank of a branch office in Tokyo. This event, trifling as it may seem of itself, is pregnant with significance as indicating the new spirit of enterprise now awakening in the native business community. The following list gives the names, number of branches, capital and date of establishment of the 19 commercial banks now doing business in Chosen :—

Bank	No. of Offices	Capital	Date of Establishment
		1,000 yen	
Dai Ichi Ginko	2	800*	May 4, 1878.
Juhachi Ginko	8	1,650*	January 1, 1880.
Hyaku Sanju Ginko	4	650*	July 20, 1882.
Mitsuyo Ginko	1	50	March 1, 1907
Sichisei Ginko	1	435	August 1, 1912.
Keijo Ginko	2	1,000	September 5, 1913.
Hansung Bank	9	3,000	February 7, 1903.
Chosen Commercial Bank ...	8	1,000	March 7, 1899.
Han-il Bank	5	500	August 8, 1906.
Ho-soh Bank	2	300	July 4, 1913.
Sanwa Ginko	1	300	November 10, 1916.
Taiku Bank	3	500	July 7, 1913.
Sennan Ginko	1	300	September 2, 1912.
Kyung-nam Bank...	3	500	September 21, 1912.
Fusan Shogyo Ginko	4	500	April 21, 1913.
Shingishu Ginko	1	500	November 24, 1917.
Tong-nai Bank	1	500	September 14, 1918.
Pooksun Commercial Bank ...	1	500	October 2, 1918.
Wonsan	1	500	February 28, 1919.
Total	58	13,485	

*These figures do not represent the full amount of capital, but that part registered as the capital of its branch offices in Chosen.

The development of these commercial banks is shown in the following table :—

Liabilities

Year		Capital Paid-up and Reserve Fund	Deposits	Government Account	Loans
		Yen	Yen	Yen	Yen
1910...	...	4,239,530	9,684,026	285,720	303,265
1911...	...	4,967,030	9,538,360	265,097	550,763
1912...	...	6,263,729	10,123,218	541,696	1,315,566
1913...	...	7,224,983	11,186,062	385,616	1,732,263
1914...	...	7,421,160	11,546,518	367,577	1,675,212
1915...	...	7,575,615	13,388,514	349,537	1,380,321
1916...	...	6,678,200	18,411,330	331,497	861,769
1917...	...	7,483,883	23,254,304	277,457	3,314,050
1918...	...	9,722,850	37,570,630	259,416	3,574,975
1919...	...	13,061,750	52,323,767	249,416	11,007,340

Year	Due to Other Banks	Other Liabilities	Total
	Yen	Yen	Yen
1910	500,240	3,231,199	18,243,980
1911	569,833	3,957,169	19,848,225
1912	651,387	3,525,134	22,420,730
1913	630,702	3,959,582	25,420,730
1914	624,477	4,918,960	26,553,904
1915	1,029,717	3,276,102	26,999,809
1916	1,137,683	3,723,314	31,143,738
1917	1,439,115	5,581,972	41,350,781
1918	2,751,305	8,631,352	62,510,530
1919	3,544,150	15,854,769	96,041,194

Year		Cash in Hand	Money at Call, etc.	Bills Discounted and Advances	Investments
		Yen	Yen	Yen	Yen
1910...	...	887,615	1,089,705	14,298,040	98,495
1911...	...	905,397	534,614	13,038,369	725,770
1912...	...	1,036,356	458,535	16,681,135	1,414,552
1913...	...	1,144,867	267,305	18,545,058	1,470,627
1914...	...	761,582	450,648	17,830,979	1,482,962
1915...	...	860,200	681,913	18,881,554	1,995,342
1916...	...	1.270,523	774,939	21,048,121	2,278,615
1917...	...	2,330,642	963,448	29,093,394	3,306,886
1918...	...	4,016,570	1,355,876	44,968,721	3,541,058
1919...	...	4,816,102	1,838,075	78,385,229	2,682,707

Year	Due from Other Banks	Bank Premises, etc.	Total
	Yen	Yen	Yen
1910	524,774	1,345,351	18,243,980
1911	3,033,904	1,610,171	19,848,225
1912	363,116	2,567,036	22,420,730
1913	352,900	3,338,469	25,119,226
1914	207,213	5,820,519	26,553,903
1915	399,898	4,182,897	27,001,804
1916	515,035	5,256,560	31,143,793
1917	724,955	4,931,456	41,350,781
1918	996,648	7,631,655	62,510,531
1919	1,452,787	6,866,292	96,041,194

Development of Agricultural and Industrial Banks.– These banks, which played so important a figure in the banking history of Chosen, have ceased to exist since September 30, 1918, when they were amalgamated into one large institution, the Chosen Industrial Bank. This amalgamation, however, does not signify that the older institutions failed in their object, or in their business, nor does it signify that their services were no longer needed. It is true that they had many shortcomings, and that these became more and more evident as they drew nearer to the end of their existence, but on the whole their career was one of development and useful service. At the time of annexation there were in Chosen six agricultural and industrial banks, their number which was once nine having been reduced to six by amalgamation, and these with their numerous branches, 41 on September 1, 1918, covered fairly well the whole peninsula. In almost every place, of commercial or agricultural importance, one of their branches could be found, and, inadequate as they were in the means at their disposal and in their equipment, proved indispensable credit-givers in their respective localities. Excellent service was also rendered by them in the form of assistance given to the central bank in the prosecution of its financial programs, the notable case being the withdrawal of the old debased coins and the dissemination of the new ones. On the other hand, the Bank of Chosen was not slow in helping them out of the difficulties into which some of them fell on more than one occasion. Through their very nature they displayed a constant tendency to lock up their funds, which, by the way, consisted of capital, proceeds of debentures, and government loans, in land and other immovables, and this made the timely assistance by the Bank of Chosen all the more necessary. It was once observed that they acquitted themselves rather poorly of their first duty, that of supplying agricultural funds, but then they had to deal with one of the most difficult banking problems in any country, viz., agricultural credit. They were certainly no less successful than most of the institutions of the same kind in Japan. In the following table are given their names, capital, and so forth as they were in September, 1918, just before the amalgamation :—

Banks	Capital Sub-scribed	Capital Paid-up	Re-serve Fund	De-posits	Loans	De-bentures	Govern-ment Account
	1,000 Yen	1,000 Yen	1,060 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
Kanko Noko Ginko...	1,000	550	148	2,879	4,906	1,000	462
Keisho Noko Ginko...	600	300	167	2,765	4,006	600	290
Heian Noko Ginko...	200	200	18	2,432	3,789	500	396
Jenshu Noko Ginko...	300	150	104	1,451	2,061	430	60
Koshu Noko Ginko...	300	150	73	1,421	1,772	370	90
Kankyo Noko Ginko	200	119	95	2,180	2,218	100	160
Total	2,600	1,469	606	13,130	18,755	3,000	1,459

Their development may be gathered from the following table:

Year		Capital Sub-scribed	Capital Paid-up	Re-serve Fund	De-posits	Loans	De-bentures	Govern-ment Account
		1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
1906...	...	1,100	508	7	163	919	450	818
1907...	...	1,200	588	37	511	2,203	450	1,003
1908...	...	,,	555	108	752	2,681	1,050	1,094
1909...	...	,,	,,	114	2,182	4,124	1,050	1,134
1910...	...	,,	,,	144	3,223	6,344	990	,,
1911...	...	,,	818	185	4,140	8,509	1,780	,,
1912...	...	2,400	1,348	386	4,469	10,456	1,780	1,479
1913...	...	2,600	1,467	479	4,599	11,583	2,990	1,469
1914...	...	,,	1,469	486	4,718	11,554	2,910	1,459
1915...	...	,,	,,	487	6,456	11,462	2,319	,,
1916...	...	,,	,,	440	8,017	12,713	1,739	,,
1917...	...	,,	,,	552	9,734	17,664	3,000	,,

Development of Credit Associations.—The local credit association in Chosen is perhaps one of the smallest institutions of the kind, at least when taken individually. In its earlier days the funds at the disposal of each association were confined to Y. 10,000 contributed by the government, and though in later days this sum was augmented by subscription to its shares by members and by members' deposits, the amount disposable was never anything considerable. But it may be said that the very efficiency of the association rested in its smallness, which matched well the condition of the Korean peasants in days gone by. A change, however, became needful as time progressed and the economic power of the peasantry increased, so the association regulations, originally enacted in 1907 and revised in 1914, were revised for the second time in 1918, and, as the result, not only has the scope of their operations been largely extended, but it has also been made possible to create under the same regulations town-associations administering to the needs of petty traders and merchants. The main points of the changes introduced by the new regulations may be summarized as follows :

The amount of a share hitherto fixed at Y. 10 was extended to a sum not less than Y. 10 and not more than Y. 50; the principle of election was recognized in the appointment of its officials, exceptions being made of certain associations for which Japanese managers appointed by the government are required as hiherto; the association was authorized to issue warehouse-warrants on the goods deposited with it by its members; it may act as an agent for any bank; and last, but not least, associations in urban districts were authorized to engage in bill-discounting.

In a word, the associations are being turned into so many small banks to serve the poorer people of every class. These institutions are scattered all over the peninsula, 391 in all, and can be approached by any farmer desirous of obtaining funds on reasonable grounds. Their development in the past is shown in the following table :—

Liabilities

Fiscal Year		Capital	Foundation Fund	Reserve Fund and Balance from Previous year	Loans	Deposits	Other Liabilities	Total
		1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
1910...	...	—	1,170	59	279	—	170	1,679
1911...	...	—	1,530	159	345	—	132	2,166
1912...	...	—	1,890	275	406	—	142	2,714
1913...	...	—	2,080	396	441	—	541	3,459
1914...	...	71	2,334	491	465	108	474	3,944
1915...	...	177	2,467	530	476	294	360	4,307
1916...	...	309	2,570	583	470	458	655	5,047
1917...	...	494	2,679	682	547	736	1,292	6,433
1918...	...	709	2,682	812	959	1,405	2,527	9,096
1919...	...	1,627	2,884	899	10,445	5,502	6,065	27,424

Assets

Fiscal Year		Advances	Premises, etc.	Money at Call	Other Assets	Cash on Hand	Total
		1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
1910	...	762	61	497	59	298	1,679
1911	...	1,182	98	566	53	265	2,166
1912	...	1,725	150	636	8	194	2,714
1913	...	2,158	266	435	417	180	3,459
1914	...	2,147	361	728	552	154	3,944
1915	...	2,127	411	1,251	385	131	4,307
1916	...	2,818	428	1,121	553	124	5,047
1917	...	3,761	512	889	1,131	138	6,433
1918	...	5,144	535	736	2,499	180	9,096
1919	...	18,329	673	1,780	6,011	628	27,424

The Closing of the Agricultural and Industrial Banks and the Establishment of the Chosen Industrial Bank.—We have already pointed out that the Agricultural and Industrial Banks, though excellent institutions in themselves, had many shortcomings, and these became more and more evident as they drew nearer to their closing days. The fact is that the times had changed and old institutions had to be made conformable with the altered state of things sooner or later, and, in this case, the alteration was made by closing the older institutions and establishing a new one. One of the principal shortcomings of the Agricultural and Industrial banks was the lack of unity and co-operation between them. With different business districts, boards of directors, and wide disparity in capital and other resources, and varying in degree of soundness or unsoundness, each was wont to go its own way, making it extremely difficult, if not impossible, to secure the much needed co-operation and mutual assistance which, if secured, would have benefited all. In many cases funds were found lying idle in one bank while another was hard pressed for them. Another of their shortcomings was the inadequacy of capital. At the time of amalgamation the capital of the six banks amounted in the aggregate to only Y. 2,600,000, and that of the smallest one to Y. 200,000 only, and although they were granted government loans their funds proved far from sufficient. In short, not one of them could have been anything but a weak institution had it not been backed by the government, whereas, combined together with capital sufficiently enlarged, they were capable of being formed into a strong institution standing on its own feet, and firm enough to inspire confidence on its own merit. To remove these defects, several views were advanced, some of which favoured the establishment of a hypothec bank, such as the one in Japan, to act as the central bank, leaving the agricultural and industrial banks essentially as they were. Somehow, these opinions were dropped, but a law was issued in June, 1918, authorizing the establishment of the Chosen Industrial Bank with a capital of Y. 10,000,000, into which all the agricultural and industrial banks then in existence were to be absorbed. The shareholders of the old institutions were given share for share in the new institution, and the balance was placed on the market for public subscription. On the 1st of October, 1918, the Chosen Industrial Bank came into being, at the same time the older institutions were closed and their business transferred to the new bank. As far as appearance goes this produced but little change, since all the offices of the Agricultural and Industrial Banks, both head and branch offices, were converted into branches of the new bank, with the exception of the one in Seoul which was made the head office. But, in the internal management a complete change was made. Mr. T. Mishima, senior director of the Bank of Chosen, was appointed president of the bank while still remaining director of the Bank of Chosen. One of the directors was further chosen from the staff of the same bank, while not one director was supplied by the former institutions, although a great majority of the staff remained officials of the new bank. Thus the Chosen Industrial Bank entered upon its career in the 1st of October, 1918, quite new in most respects, yet with 46 branches, a built-up business, and a body of well-trained men. The business of the bank was, as is natural, the same in the main as that of the old agricultural and industrial banks, but some new additions were made in order to meet the fresh requirements called forth by the recent agricultural and industrial development. The following is a brief summary of

its business :—(1) to make loans on the security of immovable property or the rights to immovable property, redeemable in annual instalments within a period of thirty years, or in one sum within a period of five years ; (2) to make loans on the security of fishing rights, redeemable in one sum within a period of five years ; (3) to make loans of the description of (1) on the security of foundations organized by law ; (4) to make loans without security on the joint signatures of 20 or more farmers or industrials, redeemable in one sum within a period of five years ; (5) to make loans of the description of (1) without security to public bodies ; (6) to make loans of the description of (1) without security to credit associations, fishery associations, and similar other legal persons, the object of which is not money making ; (7) to make loans on the security of the native products of Chosen or the goods necessary for native industry ; (8) to make loans on national loan bonds or other bonds approved by the government-general of Chosen ; (9) to deal in bills of exchange with or without documents ; (10) to subscribe to or underwrite debentures of public bodies or of companies whose object is to engage in industrial works in Chosen ; (11) to engage in trust business ; (12) to receive deposits of money, or of gold and silver buillion, and documents of value for safe keeping, etc.

The bank is authorized to issue debentures to the extent of ten times the amount of its paid-up capital, and also to engage in the business of a commercial bank for the time being.

It is yet too soon to dwell upon the doings of this new institution, but the following statement will show something of the activity it has already launched upon :—

Chosen Industrial Bank
Balance Sheet, December 31, 1919

Liabilities	Yen
Capital and reserve fund	8,684,750.00
Agricultural deventures	17,500,000.00
Deposits	34,883,443.72
Government account..	1,459,980.60
Loans	11,297,402.46
Due to other banks	2,961,267.06
Other liabilities	2,115,261.43
Total	78,902,105.27
Assets	Yen
Cash in hand	5,068,685.55
Agricultural advances	29,371,697.42
Other advances	41,684,022.13
Investments	562,384.25
Due from other banks	616,249.02
Bank premises, etc.	1,599,066.90
Total	78,902,105.27

Banking in Manchuria

By T. HOSHINO

THE origin of banking in China is enshrouded in mystery. But it is recorded that in the reign of Emperor Hsien Tsung of the Tung Dynasty (806-821 A.D.), there prevailed in China a method called *feichien* (flying money) by which one could pay in money at a government office in the capital and receive in exchange therefor a bill which he might present at a local government office for encashment. This was apparently the origin of bills of exchange in China. Much the same method obtained in Korea under the name of *wei-hwek*, in which the indebtedness of a local office to the central and *vice-versa* were availed of as a means of remittance.

There are at present three types of native banking in China represented by the *piaochuang*, *chienchuang* and *yinlu*, and it is interesting to note that these three types had three different origins and developed along lines greatly differing from one another.

About 280 years ago there was established in the province of Shanhsi a private institution with a view to engaging in the remittance of money from one place to another. It being successful, many similar institutions came into being, and all these were called by the general name of Shanhsi Piaochuang. The business of these institutions was first confined to the remittance of money, but it was extended, as time went by, to other lines of business, until it came to include nearly all the branches of what we now call banking. They established branches and correspondents at nearly all the important points of the Chinese empire, including Manchuria, and the influence exercised by them was at one time so great that it seemed to monopolize the financial business of that great empire. Such was the origin of the once famous Shanhsi Piaochuang.

Again, the disorderly state of currency existing in China for many centuries past called into being a horde of money-changers, whose business was to exchange one local coin for another and get profit out of the exchange. The progress of the inter-provincial trade in the sequel of the opening of Shanghai made the demand on this business so much the greater, and in consequence those engaged in the business grew in number as well as in wealth. These also began to receive deposits, make advances, issue bills of exchange, and generally carry on banking business. Thus were originated what now go by the name of *chienchuang* or *chienpu*.

Then there were silversmiths called *yinlu* engaged in the making of sycee, and these also developed their business into banks, in so far as they received deposits from customers, and effected monetary settlements between such customers by mere book transfers, thus eliminating the use of actual money. This gave birth to that famous system of the "transfer tael" in Newchwang.

Thus the *piaochuang*, *chienchuang* or *chienpu* and *yinlu*, which represent the three principal types of native banking in Manchuria as well as elsewhere in China, sprang from three distinct origins, and it is interesting to note that, though their functions are now largely intermingled, each still retains some of its old traits.

The practice of raising money by pawning goods has also been in evidence in China from time immemorial, and, as far back as the period of Tung, we see restrictions placed on the amount of interest and regulations as to the manner in which interest is added to the principal.

All these bank-like organs exist to-day, though both *piaochuang* and *yinlu* have now practically disappeared from Manchuria except in Antung where, strange to say, both these institutions still exist, though what they now enjoy is but the shadow of their former prosperity. We will not go, therefore, into details of these institutions, but go straight on to a description of the *chienpu*, which, though shorn of much of its former importance, still plays an active rôle in the Manchurian money market.

The *chienpu*, also called *chienchuang* or *yinhao*, is generally of partnership organization with a capital ranging from *Yuan* 50,000 to 200,000. They exist in almost every town, and the small ones, faithful to their tradition, still make money-changing their principal business. But the larger ones receive deposits, make advances, issue bills of exchange, and also the notes which we described as *tiehtzu* in the previous chapter, and further engage in the sale and purchase of moneys. Take a *chienpu* in Changchun, where they prosper most, and examine its working a little. The deposits are divided into the current and fixed. On current accounts no interest is paid, but on fixed deposits interest is paid at the rate of something like 5 per mille monthly, making 6 per cent. per annum. Though no interest is paid on current deposits the accounts amount to a considerable sum with some *chienpu* and

are made the source of many profitable operations. The payment made through the *chienpu* is called *chenma*, and is effected by the depositors informing his *chienpu* of the amount to be paid and the name of the beneficiary. Advances are made on personal credit, with or without the guarantee of a surety and rarely on collateral securities. The term is three months at the longest, ordinarily one month. The rate of interest is, of course, subject to the market rate, but generally 1 per cent. per month. To reliable customers, the *chienpu* is always ready to allow an overdraft to a certain extent, changing them more or less high interest. Since advances are as a rule based upon personal credit, they keep more than ordinary vigilance over the financial condition of their customers. They are rather inclined to refuse advances altogether than to demand collateral securities. The exchange operations of the *chienpu* are confined to the local remittance of money, and are generally on a very small scale. Those on larger scale were formerly conducted by the *piaochuang* and at present by the banks of modern type.

Pawn-Shops.--Pawn-shops are found in almost every place in Manchuria. The largest is called *tang*, the next in size *chihtien*, and the smallest *ya*. These constitute practically the sole monetary organs accessible to farmers, petty merchants and the lower classes of the people generally. The large pawn-shops, called *tang*, are often affiliated to the banks of modern type, and are established sometimes by men of high official position, with a capital upward of *Yuan* 50,000. Thus the Kung Chi Tang, a large pawnshop with offices at Mukden, Newchwang, Antung and Chengchiatun, is a subsidiary organ to the Three Eastern Provincial Bank, while the Kirin Government Bank has also a pawn-shop attached to it. Also in Newchwang there is a pawn-shop called San Hui Tang largely financed by provincial officials of position.

The rate of interest charged by the pawn-shops ranges from 2 to 3 per cent a month, while the term is often prolonged to one or two years. The articles pawned consist chiefly of clothing, followed by jewelery. In small pawn-shops called *ya* the interest is much higher, being 4 to 8 per cent. a month, and the term rarely exceeds four months. The private notes called *tiehtzu* are largely issued by pawn-shops, and there are places, such as Chinchou, where the note-issue is practically limited to them. The private notes, issued by the San Hui Tang above referred to, enjoy a credit unsurpassed by any native bank-note.

Native Banking of Modern Type.--Modern banking in Manchuria, so far as our knowledge goes, dates from 1897, when the Russo-Chinese Bank established its branch office in Newchwang. In all probability the English had a monetary organ to serve their interests, presumably an agency of the Hongkong & Shanghai Banking Corporation, but we have at hand no data to prove the fact. The Yokohama Specie Bank opened its branch in Newchwang in 1900. The establishment of modern banks by the natives belongs to the period following the Russo-Japanese war, and the Mukden Government Bank (now Three Eastern Provincial Bank) which was founded in 1905 may be regarded as the first institution of the type ever established in Manchuria. An institution, which afterwards became the provincial bank of Kirin, was established at Kirin as early as 1898, but it is doubtful if it could properly be called a bank of modern type at the time of its establishment, its very capital then being unknown to a certainty.

At the end of May, 1919, there were altogether 22 native banks of the modern type in Manchuria, 10 of which had their head offices in South Manchuria, and 12 in North Manchuria. Besides, there were four banks having head offices in China proper. These 26 banks, with their branches and agencies, cover well-nigh all the important points of Manchuria, and outwardly Manchuria is by no means destitute of modern banking facilities administered by the natives. But a closer observation will reveal the fact that these institutions, modern to all appearance, are, with a few exceptions, not modern in their practice. They publish no statements, so that the public is left in the dark as to their financial standing. Nearly all of these institutions are vested with the power of note-issue, which however has been abused to the last extreme. Speaking generally, most of these institutions are financially weak, and have no such credit as banking institutions in other countries generally have in their respective communities. But it would be too much to say that they are useless or even harmful in all cases. Poorly backed as they are by specie, with payment often suspended, their notes still circulate, though always at a discount, and are nevertheless indispensable for the trade and commerce of the country. Nor is their superiority to the banks of the old style to be doubted for a moment, for since their appearance all the business hitherto conducted by the old-style bank is gradually passing into their hands. The root of the evils, it appears, is in the chaotic state of currency, and in the lack of strong central authorities to enforce the laws and regulations which are, as we have seen, in the main excellent.

The difference in nature of these native institutions may be inferred to some extent from their names. The provincial government banks are endowed more or less with the nature of a central bank, the Mukden Industrial Bank and the Territorial Bank, with the nature of an industrial bank, and the Bank of Communication with that of an exchange bank. But these differences are more nominal than real. Owing to the fact that, as noted above, no statement whatever is published by these banks, it is difficult to gauge their condition. One of the Japanese periodicals in Manchuria, the *Mammo-jitsugyo-iho*, has published a table showing the financial status of the native banks in Mukden, as they stood at the end of June, 1918. In the absence of any other information, this is given below in all its incompleteness.

Banks	Deposits			Advances		
	Government	Public	Total	Government	Public	Total
	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*
Three Eastern Provincial Bank	1,395	1,205	2,600	500	4,085	4,585
Mukden Industrial Bank ...	?	?	?	1,000	2,000	3,000
Mukden Branch of the Bank of China	1,000	230	1,230	150	500	650
Mukden Branch of Communication Bank ...	400	300	700	200	400	600
Mukden Branch of the Territorial Bank	?	?	?	100	2,000	2,100
Mukden Branch of the Amur Govern't. Bank ...	?	?	?	50	50	100
Mukden Commercial Bank	?	500	500	?	1,441	1,441
Total	2,795	2,235	5,030	2,000	10,476	12,476

A glance at the above table, which, if not correct in details, may at least be taken as indicative of some of the principal features of these banks, will at once show that the deposits are exceedingly small as compared with the advances. This is due to some extent to the conservativeness of the people, but the small credit enjoyed by the banks must largely account for it. Many of the people think it safer to keep their money in their strong box, or to place it in the care of some big merchants or rather of the *Chienpu*. The result is that these banks must seek other resource for their loanable funds. Nor can they depend upon their capital, which is generally very small, and the difficulty of increasing it is easily imagined from the fact that, with the credit of the Bank of China, it was no easy matter for the authorities to find subscribers to its new shares. The two main sources of funds being thus but slightly available, the only course open to them is the note-issue, and with what freedom this course was resorted to by the native banks has been pointed out. Under these circumstances, the growth of the deposit banks, which in other countries are the bones and sinews of their financial structure, is hardly possible in Manchuria.

The abhorrence with which the commercial public regard the contract of loans on collateral securities is another obstacle in the way of the healthy development of banking. Most advances are made on personal credit, or at best on the guarantee of friends of the borrowers. It is clear that no sound banking can exist so long as this custom obtains.

Interest charged by such large banks as the Three Eastern Provincial Bank, the Bank of China, or the Bank of Communication is said at this moment to range between 12 to 16 per mille monthly (14 to 19 per cent. per annum), that by the Territorial Bank from 14 to 20 per mille and that by the Mukden Commercial or

Huafu Industrial Bank from 14 to 22 per mille. In addition to this, the borrower has to pay extra as commission to the bank's officials—another objectionable feature in native banking—and also to his surety. Thus it will be seen that money costs pretty dear in Manchuria, but there is no wonder in this, when the risk of depending purely on personal credit, by no means always very solid, is taken into consideration.

Deposits are received on current account or for a fixed term. The rate paid on them is said to be 9 per cent. for a fixed deposit, and about 3½ per cent. for current deposit, but actually seems to be considerably lower. They certainly could not afford to pay much on their deposits when they have a more profitable source of funds in issuing notes, for which no adequate reserve is usually kept.

Japanese Banks.—Japanese banking in Manchuria dates from 1900 when in January of that year the Yokohama Specie Bank opened a branch office at Newchwang. The following few years saw the bank make a rapid progress, thanks to the constant growth of Japan's trade with Manchuria, to which the bank in its turn made an important contribution.. In January, 1903, it issued its first notes in Manchuria. On the outbreak of the Russo-Japanese war, the bank was compelled to close its Newchwang branch, but when the port was occupied by the Japanese the following year, not only was the branch re-opened, but new offices were established at Dairen, Liaoyang, Mukden and Tiehling, as these places were occupied one after the other by the Japanese troops, and these were made the so-called cash offices of the Manchurian armies of Japan. After the war the bank was entrusted by the Japanese government with the task of withdrawing its military notes diffused during the war, and also of generally assisting in the promotion of the trade between that country and Manchuria. More branches were subsequently established in Changchun, Harbin and Kaiyuan, and with its general office, first at Newchwang and then at Dairen, the bank came to enjoy much the same position as the one once enjoyed by the Dai Ichi Ginko in Korea. It is indeed a strange coincidence that both these banks were destined at a later period to transfer much of the business in their respective fields to the one and the same bank, the Bank of Chosen.

But the Yokohama Specie Bank, whose leading business was in the line of exchange, fell in many instances short of the demand made on it by the Japanese public in Manchuria, who required long term loans in order to finance their enterprises, and these the bank could not afford to grant from its very nature. But the drawbacks were remedied to some extent through the government measure, by which the Bank of Japan was called upon to make to the bank a low interest loan of Y. 3,000,000, later increased to 5,000,000, to be used for these specific purposes.

In 1906 a Chino-Japanese Joint Stock Bank called Shoryu Ginko was established with a capital of 300,000 silver yen at Newchwang with a branch at Dairen. The result of its business in its initial stage was anything but satisfactory. It was in consequence completely reorganized in 1911, its capital being increased to 700,000 gold yen and 300,000 silver yen all paid up, while its head office was removed to Dairen. After that the progress of the bank was phenomenal. It is now the largest bank having its head office in Manchuria and managed by Japanese. To cope with the expansion of its business the bank's capital was increased to Y. 3,000,000 in 1905.

Subsequent to the establishment of the Shoryu Bank a large number of Japanese and semi-Japanese banks were established. But the most significant event in the financial history of Manchuria of recent days is the appearance of the Bank of Chosen in Manchuria. Of the progress of this important institution, details will be given later on, but to summarize its career, this peninsular Bank has had a branch in Antung ever since its establishment, transferred to it by its predecessor, the Dai Ichi Ginko, but for various reasons the bank remained inert so far as its Manchurian business was concerned. Meanwhile the bridge over the Yalu was completed, the reduction by one-third of the regular tariff on land trade came into force, and all this resulted in a great development of trade between that peninsula and Manchuria. Moreover, such was the trade condition of the peninsula at that time that, unless the bank extended its sphere of business to adjacent countries, it was difficult for it ro maintain its specie reserve. Prompted by these various reasons the Bank of Chosen appeared in the Manchurian financial field, and, without being aggressive, so great was the demand made on it that its business was soon found expanding in all directions, outstripping many older institutions, not excepting even the Yokohama Specie Bank. There is little wonder in tfiis, however, for the Bank of Chosen partaking of the character of a colonial bank is decidedly the better fitted of the two, for the services required in Manchuria.

Finally, in December, 1917, the various privileges hitherto enjoyed by the Yokohama Specie Bank were made over to the bank, making the latter the central bank of Japanese Manchuria.

Another Korean institution entered Manchuria in 1917. That was the Oriental Development Company. Originally established to engage in Chosen in the colonization and exploitation of the country, the company was later enabled by a revision of its laws to extend its work outside the peninsula. It established branches in Mukden and Dairen in October, 1917, took over the business relative to the industrial funds elsewhere explained from the Yokohama Specie Bank, and made itself the chief supplier of industrial credit in Manchuria. The chief feature of the banking department of this company is in the great variety of the securities upon which loans are made, including mining rights, lands, houses, factories, forests, railroads, etc., either direct or through other institutions. Its activity in Manchuria is best shown by the fact that during the period of about one year ending February, 1919, the total amount invested by it aggregated no less than Y. 11,300,000. The company has further acquired interest in some 18 companies, mostly through subscription to their shares. The Tosho Jitsugyo Kaisha, capital Y. 3,000,000, is a company of its creation, and closely affiliated to it in business. The principal business of this company consists in loans on products, estates, etc.; buying and selling of products on its own account or on account of third parties; trust and guarantee business; subscription to shares and debentures, etc.

JAPANESE BANKS IN MANCHURIA
(Conditions as on May 31, 1919)

Name of Bank	Date of Establishment	Authorized Capital Yen	Paid up Capital Yen	Location of Head Office	No. of Branch Offices in Manchuria
Bank of Chosen	...Oct. 1909	40,000,000	30,000,000	Seoul	18
Yokohama Specie Bank	Feb. 1880	48,000,000	42,000,000	Yokohama	6
Dairen Commercial Bank ...	...Nov. 1918	2,000,000	500,000	Dairen	—
Dairen Bank	...Dec. 1912	1,000,000	575,000	Dairen	1
Sung Hua Bank	...May 1914	1,000,000	362,500	Harbin	—
Educational Savings Bank ...	...Sept. 1900	500,000	200,000	Tokyo	1
Changchun Bank	...Jan. 1918	350,000	175,000	Chngchun	2
Trade Bank ...	...Aug. 1913	200,000	50,000	Tiehling	—
Changchun Business Bank ...	...Jan. 1918	200,000	100,000	Changchun	—
Wafangtien Bank	...Feb. 1918	100,000	50,000	Wafangtien	—
Szupingchieh Bank	...Feb 1918	70,000	17,500	Szupingchieh	—
Tiehling Bank	...Mar. 1908	50,000	31,250	Tiehling	—
Commercial & Industrial Bank ...	...Apr. 1913	50,000	25,000	Liaoyang	1

CHINO-JAPANESE BANKS IN MANCHURIA.
(Conditions as on May 31, 1919)

Name of Bank	Date of Establishment	Authorized Capital Yen	Paid up Capital Yen	Location of Head Office	No. of Branch Offices in Manchuria
Syoryu Bank ...	...July 1906	3,000,000	3,000,000	Dairen	9
Manchurian Commercial Bank ...	...May 1911	1,400,000	425,000	Antung	2
Lungkow Bank	...May 1913	1,000,000	750,000	Dairen	—
Liaoyang Bank	...June 1916	1,000,000	295,000	Dairen	5
Mukden Bank ...	...Dec. 1918	1,000,000	250,000	Mukden	—
Antung Bank ...	...May 1911	500,000	300,000	Antung	4
Tiehling Chino-Japanese Bank ...	...May 1918	300,000	75,000	Tiehling	—
Port Arthur Bank	...May 1918	150,000	37,500	Port Arthur	—
Pitzuwo Bank ...	...Jan. 1917	100,000	50,000	Pitzuwo	—
Fanchiatun Bank	...Oct. 1917	100,000	50,000	Fanchiatun	—

(*Continued on page 260*)

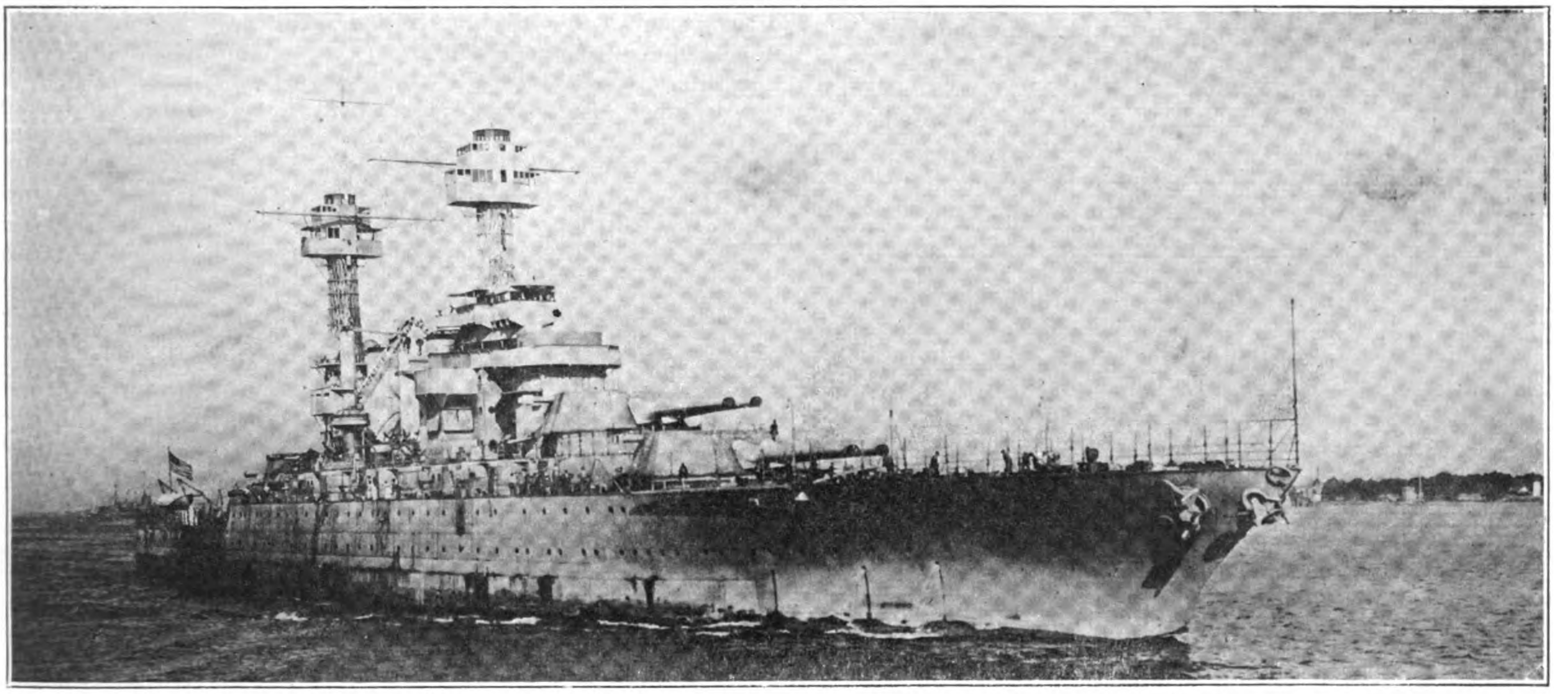
Electricity and the American Navy

THE superdreadnought, the U.S.S. *Maryland*, is in every respect the latest completed achievement of American naval architects. Carrying eight 16-inch guns, the largest ever mounted in a battleship, she will be the most powerful fighting vessel in the world. These mammoth guns, located in four turrets of two guns each, fire a shell weighing 2,100 pounds for a distance of more than 20 miles. These guns are about 57-ft. in length and for each full charge approximately 480 pounds of powder are required.

The secondary battery, consisting of fourteen 5-inch guns, is carried for use against torpedo-boats, submarines and other smaller craft. The ship has also four 3-inch anti-aircraft guns, a 3-inch landing gun, six ·30 caliber machine guns and two under-water 21-inch torpedo tubes for firing the largest and longest range torpedoes.

Captain Charles F. Preston, who has been assigned to the command of the *Maryland* and was aboard during the preliminary trials, is most enthusiastic over the perfect performance of the new electric ship. "Never on a warship that pleased me more in my 36 years with the navy. She's a wonder in every respect, the best warship in our navy and the most powerful in the world" he declared, "I am highly pleased and satisfied with her electric equipment. There is practically no vibration and sometimes I actually looked out to sea to learn if we were under power so quietly and smoothly did her machinery operate."

Like her prototype, the *New Mexico*, pioneer electric warship of the world, the *Maryland* is electrical throughout. Her main propulsion machinery consists of two Curtis steam turbine generators, each designed to develop 11,000 kilowatts at a speed of 2,030 revolutions per minute to drive the ship 21 knots. These supply



The U. S. S. "Maryland," 32,600 Tons, the latest American Fighting Ship. Electrically driven

The *Maryland* possesses all the latest provisions for protection against torpedo attacks. It is claimed by naval architects that it will be almost an impossibility to sink the ship by an under-water attack. The crew and vital parts will be protected by armor plate so thick that only the largest caliber shells, fired at moderate range, might penetrate.

Displacing 32,600 tons, this huge warship, electrically driven, will have a speed of 21 knots and a cruising radius of 10,000 miles. She will burn oil, her fuel capacity being approximately 1,392,200 gallons.

The *Maryland* is 624-ft. long and has a beam of 97½-ft. There will be 67 officers in the ship's completement and more than 1,400 men in her regular crew.

This most modern of warcraft recently completed her builders trials with a perfect record. For 33 continuous hours at sea off the Virginia Capes, she was put through all sorts of tests, bringing into play the greatest possible stress on all parts of her machinery and equipment but not the slightest trouble was experienced. In fact naval officials declared she operated more like a boat that had been in service four or five years, so readily and easily did she respond in the tests.

power to four 7,000 horse-power General Electric induction motors, directly connected with the four propellers and turning at 170 revolutions per minute. The motors, among the largest ever built, are 12-ft. in diameter, weigh 62 tons, and the 28,000 horse-power thus available for propulsion purposes is enough to supply power to a city of 100,000 population.

The two turbine generators, supplied with steam generated by eight oil-burning boilers, can be run independently. Either is capable of driving the ship up to a speed of about 17 knots. The power generated by them is used for no other purpose than propelling, electrical current for other needs being generated by six 300-kilowatt turbine generators.

Virtually every electrical appliance used afloat and ashore has been installed in this new battleship. The electrical equipment includes radio telegraph, loud-speaking telephones, ordinary telephones, gyroscope compass, steering gear, anchor windlass, capstan, boat cranes, winches, air compressors, air heaters, turret training, turret gun elevating, ammunition hoists, gun firing, range signalling, powder testing oven, common deck fans, ice machines, laundry equipment, carpenter shop, lighting, visual signals, motion pictures, sterilizer in operating room, potato peeler,

ice-cream freezer and other kitchen utensils, bake ovens, irons for laundry and tailor, storage batteries, motor-boat ignition, etc.

It is probable that no ship built by any nation in the past has been so thoroughly equipped for the comfort and convenience of the crew.

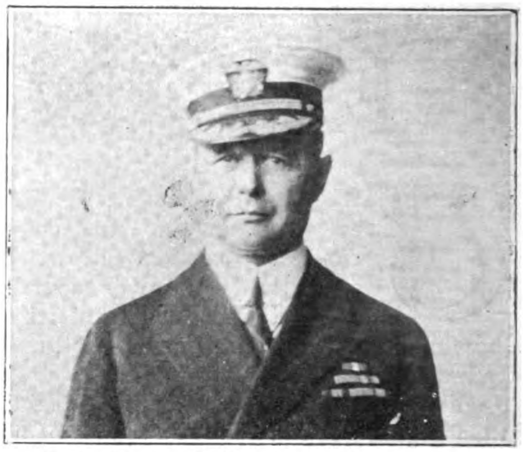
A completely equipped hospital will be maintained on board with navy surgeons to look after the health of the crew and a dentist to look after the men's teeth. A chaplain will be assigned to the ship to hold regular church services and to devote his time to spiritual welfare of the officers and men.

The *Maryland* is third in order of completion of the electrically propelled battleships for the navy. She was built by the Newport News Shipbuilding & Dry Dock Company and the electrical equipment was designed and manufactured by the General Electric Company.

The ship was launched on March 20, 1920. Her chief characteristics are :

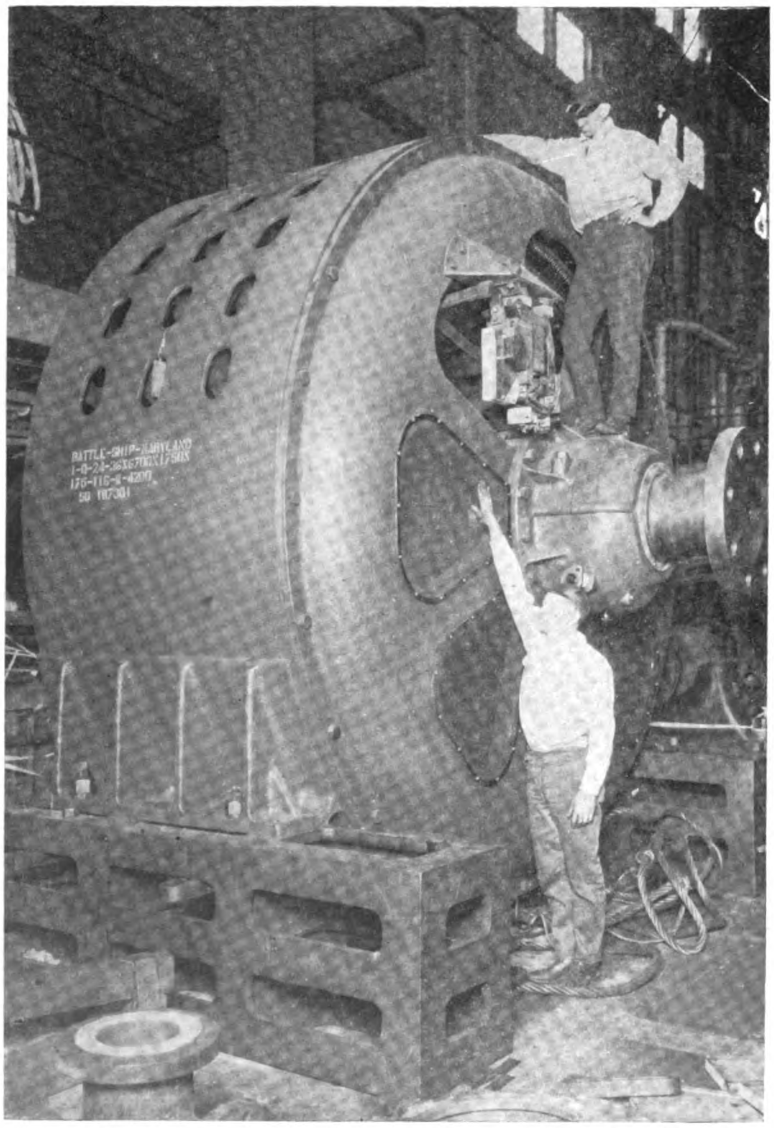
Length	624 feet
Beam	97 1/2 feet
Draft	30½ feet
Weight	32,000 tons
Speed	21 knots
Number of propellers	4
Shaft horse-power	30,000
Oil capacity	1,400,000 gallons
Oil-burning boilers	8

Four more battleships of this type are being built, the *California* to be completed this summer ; the *West Virginia* to be ready for her trial trips in 1922, the *Colorado* and the *Washington*. In addition the navy is building six 43,000-ton, 60,000 horse-power battleships and six battle cruisers, rated at 180,000horse-power each or six times as powerful as the *Maryland*. Both of these type of warships will carry 16-inch guns and will be electrically driven.



Capt. Charles F. Preston of the U. S. S. "Maryland"

Production of the electrical machinery for several of these vessels is now progressing under the direction of W. L. R. Emmet, consulting engineer of the General Electric Company, who advocated the principles of the electric drive as long ago as 1909, was instrumental in its adoption by the government, and designed the first electric drive installed by the navy on a battleship, now working so successfully on the U.S.S. *New Mexico*.



One of the Propeller Motors of the U. S. S. "Maryland"

Banking in Manchuria

(*Continued from page 258*)

Foreign Banks.—Three are three foreign banks doing business in Manchuria, viz., the Russo-Asiatic Bank, the Hongkong and Shanghai Banking Corporation, and the Chartered Bank of China, India and Australia. The Russo-Asiatic Bank was the first of the foreign banking institutions to establish a branch in Manchuria, its Newchwang office having opened to business in 1897. It now retains but a shadow of its former prosperity, yet it still has branches at Newchwang, Dairen, Changchun, Tiehling, Kirin, Harbin and Tsitsihar, and exercises no small influence in its own sphere. The Hongkong and Shanghai Banking Corporation has agencies in Dairen, Newchwang and Harbin, and the Chartered Bank of China, India and Australia only in Newchwang. These English banks confine their business chiefly to operations in exchange and, though important, their influence does not appear to be so great as in more southern provinces of China. Besides, there are two Russian local banks both having their offices only in Harbin and called the First Loan Bank and the Second Loan Bank. They were established in 1908 and 1910, and have capital of 3,090,000 and 1,080,000 roubles respectively.

Latest Banking Development.—The semi-annual report of the Bank of Chosen ending December 31, 1919, has the following :—

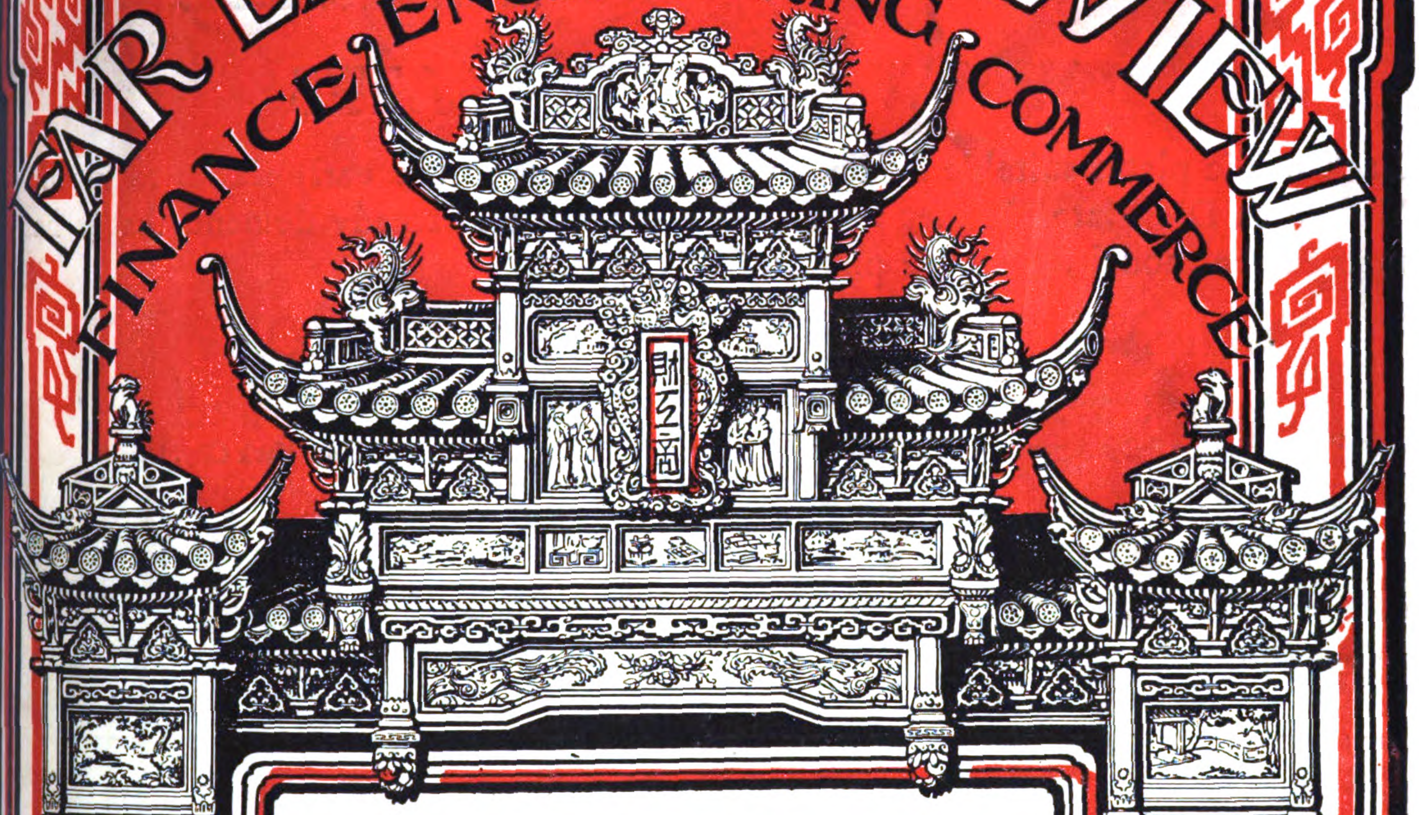
"To describe the recent banking conditions in Manchuria, there are in Manchuria at present 75 banking offices, inclusive of both head and branch offices, managed by Japanese (including 18 of our offices). At the end of November, 1919, the deposits on gold account with these banking offices stood at Y. 91,000,000 and advances, also in gold, at Y. 168,000,000. A comparison of these figures with those of a year ago will show that the deposits have increased by 50 per cent. and advances by 90 per cent. On the same date the balance in silver with them showed Y. 9,900,000 of deposits and Y. 78,600,000 of advances. On the other hand, clearings by the Mukden clearing house (where gold only is handled) ranged between Y. 7,000,000 and Y. 8,000,000 per month, while that by Dairen clearing house reached Y. 200,000,000 on gold account and over Y. 30,000,000 on that in silver. Thus the Dairen clearing house now occupies a place second only to those in Tokyo, Osaka, Kobe and Yokohama. The great demand for funds in Manchuria will be evident from this fact alone. The establishment of new local banks and the extension of existing ones taking place in Manchuria in recent years, is but a natural sequence of this demand, and we doubt not that the healthy development of these institutions will greatly contribute to the economic welfare of Manchuria."

大正七年七月十日第三種郵便物認可

JUN 13 1922

THE FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE



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遠東時報

THE CONSORTIUM

JAPAN'S WATER POWERS

RIVER CONSERVANCY

JAVA SUGAR INDUSTRY

PHILIPPINE COAL SUPPLY

EGG PRODUCTS IN CHINA

Vol. XVIII MAY, 1922 No. 5

A. STAYLER

FIRST in the Field—

FIG. W4161. Nos. 0 to 1¾, without Leader Screw

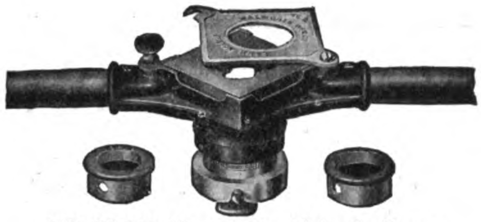

FIG. W4162. Nos. 2, 3, 4, with Leader Screw

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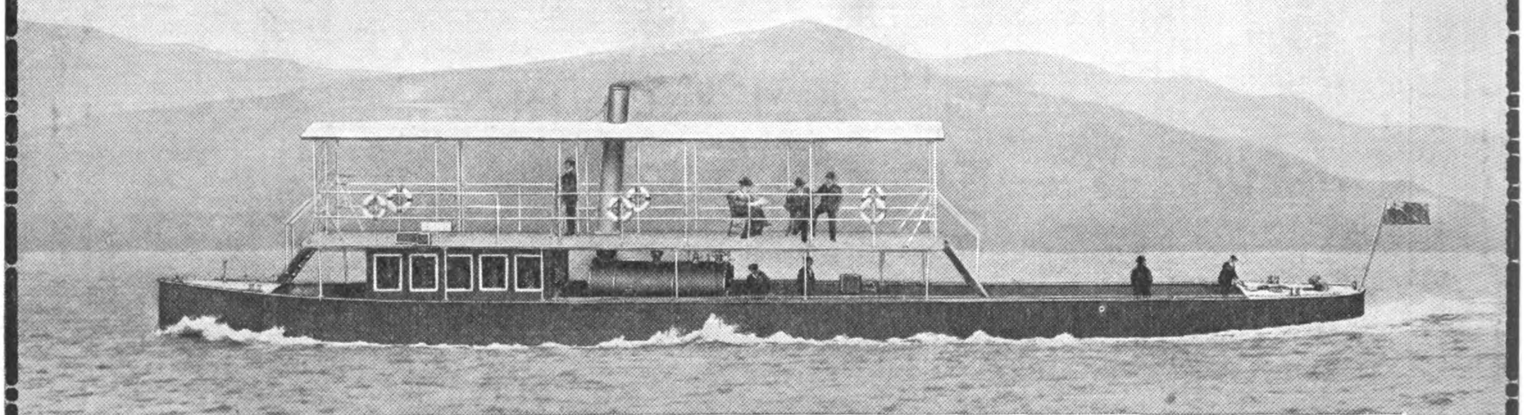

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

Vol. XVIII SHANGHAI, MAY, 1922 No. 5

THE CONSORTIUM

An Analysis of its Usefulness

IT is now three years since the first meeting of the consortium was held in Paris, and as yet it can hardly be said that any practical results have come out of this new alignment of international finance other than establishing a policy of international co-operation to supersede international competition, and a tightening of the international money market against indiscriminate and reckless borrowing on the part of China. Much water has passed under the mill since the consortium was organized. The results of the Washington conference have deprived it of political significance, superseding the agreements arrived at between the bankers by more effective understandings ratified into international law for a period of ten years. The consortium stands to-day as a purely business proposition supported by its various governments for the sole purpose of eliminating a competition that would be taken advantage of by unscrupulous Chinese officials and financial adventurers to plunge the country deeper into the mire of insolvency. On another page of this number of The Far Eastern Review will be found the speech of Sir Charles Addis on the work of the consortium together with his conclusions that if it should fail to function, its dissolution would revive the spheres of influence with the intensification of international rivalries and jealousies which marked the period of 1898-99, knowh as the "Battle of Concessions." If we admit that the treaties arising out of the Washington conference are to have any binding force, it is difficult to subscribe to these conclusions. With the recognition of China's full sovereignty, the spheres of influence have been abandoned and cannot be readily revived, whether the consortium functions or not.

In presenting arguments in favor of the consortium, Sir Charles has unnecessarily emphasized a possibility, that in the very nature of things, has vanished from the Far Eastern political stage. The one tie binding the international banking groups together at this time must be one of mutual assistance in financing China, in order to eliminate wild-cat loans and so prevent complete financial chaos, intervention, and international control of Chinese revenues for the service of past loans.

Sir Charles also advocates the practicability of negotiating with an autonomous or group of autonomous provinces for the construction of specific railway undertakings within their respective borders, and in doing so reverts to the plan proposed by the writer as the basis of Sun Yat-sen's national railway corporation in 1912. In the January, 1915, number of The Far Eastern Review, under the title of "The Status of the Chinese National Railway Corporation," the plan of financing Chinese railways through loans secured on provincial revenues guaranteed by the central government, was fully outlined. At that time, at the very inception of the republic, it was assumed that the new order would embrace a recognition of provincial rights in railway construction, and, that owing to the inability of the central government to allocate specific revenues for the security of such loans, the financiers could fall back on provincial revenues, with the added guaranty of the general revenues and good faith of the central government. It was assumed that the republican government would be organized on a basis of municipal and provincial autonomy with jurisdiction over public works and improvements within their boundaries, and that railway work could proceed without reference to the Peking government, except wherever such lines became inter-provincial, when control over rates and traffic would come under the central authority. Such a plan, harmonizing with the political tendency of the times, was, however, after most careful study, rejected by Dr. Sun Yat-sen and his advisers as involving insuperable difficulties arising out of independent negotiations with the various provincial authorities. Dr. Sun knew China and the limitations of his so-called republican governors and provincial parliaments, and realized that their ideas of autonomous rule had not reached that stage of enlightenment where such negotiations could be carried on successfully without resorting to bribery in its most obnoxious forms. Here, then, at the very outset of the new republic, its founders clearly recognized that railway negotiations, to be successful, would have to be centralized under some responsible bureau representing the federal government. At that period, there was some reason to hope that a constitutional central or federal government based on provincial autonomy would emerge from the uncertainty then prevailing. Ten years have passed. Chaos reigns in all the provinces. They are autonomous to the extent that they are dominated by military chieftains who acknowledge no allegiance to any central authority. To negotiate with any one of them separately in the matter of railways within their jurisdiction, would not only inaugurate a new era of unbridled graft, but make difficult re-establishment of the central authority.

Aside, however, from this aspect of the railway problem, the consortium faces a more delicate and serious political question in placing such a plan into operation. The groups composing the consortium cannot dissociate themselves from their respective foreign offices. The present consortium is the instrument of their governments, called into being at the special invitation of the American government, and hammered into an effective organization, through determined diplomatic support. The consortium is, therefore, political in every sense of the word, as much a part of the diplomatic machinery of the four powers whose support permits it to exist, as the embassies and legations through whom all matters are referred to the home authorities.

If the consortium, at this juncture, should initiate direct negotiations with any of the so-called autonomous provincial governments for the construction of railways, would not this constitute a formal recognition of such governments? Can the consortium initiate negotiations with Canton without conferring on that government some sort of official recognition of its status? As with Canton, so with any other of the independent or semi-independent *tuchuns*. Official recognition on the part of the foreign governments to Canton or any other so-called autonomous provincial government through their financial instrument, the consortium, would, under existing circumstances, tend to further complicate the situation, as all such negotiations must, in the end, receive the sanction of some recognized central government in order to safeguard the bondholders.

It is not difficult to sense that in advancing this argument Sir Charles had in mind the immediate resumption of work on the Canton-Hankow line, which, pending unification of the north and south, must involve negotiations with the Canton government. The Hukwang agreement covering the financing and construction of this important trunk line, provides only for the section between Wuchang and the Kwangtung border. For the line to be profitable and operated successfully, the Chinese section from the Kwangtung border to Canton (known as the Kwangtung Yueh-Han railway), would have to be taken over by the central government and brought under the consortium agreement. Here, we have a typical case of the difficulties surrounding railway finance in China. That portion of the Canton-Hankow line embraced in the Hukwang agreement and now pooled in the new consortium, must depend upon the privately controlled Chinese section in Kwangtung to reach a deep-water terminus at Canton or Hongkong, and, unless the latter be absorbed so that the entire railway can come under one management, the main section will always be at the mercy of the other. Any negotiations for a new loan to proceed with the uncompleted sections in Hunan embraced in the Hukwang agreement, must of a necessity, cover the taking over of the Chinese controlled Yueh-Han line, and here, pending unification of the country, the consortium must perforce deal with the Canton government.

This, undoubtedly, is what Sir Charles had in mind in advocating the opening of negotiations with autonomous or a group of autonomous provincial governments. In this instance, there is some force to the argument, as under any circumstances, the Yueh-Han line stands as a provincial property, independent of the ministry of communications at Peking, and if any agreement can be reached with the provincial company that would permit the consortium to take over the property and complete the section between Yintak and the Hunan border, it would assure the successful and profitable operation of the through trunk line whenever it is completed. It means, in effect, purchasing the property from the provincial company and holding it in trust for the Chinese people until such time as it can be incorporated in a larger loan with a stable central government for the completion of the other sections. While perhaps not involving recognition of the southern republic, it does emphatically involve recognition of the Kwangtung provincial government, a most essential part of the southern republic. Recognition of one would seem to imply recognition of the other, though perhaps international lawyers might find some precedent for negotiating with the autonomous province without compromising the consortium into recognizing the southern republic.

The arguments advanced by Sir Charles, indicate that the consortium is having a difficult time in breaking through the many obstacles that lie in the path of its success. As the head of the British group, Sir Charles is naturally interested in any plan that will hasten the completion of the Canton-Hankow line, while the other groups are equally interested in seeing some of their own pet projects realized. Although working in complete harmony, the various groups in the consortium have their own ideas of what work is most important to be carried out without delay. The American group has a natural preference towards starting work on the Hankow-Szechuan line and the Grand Canal, while the Japanese would like to see the extensions of the Shantung line taken up as soon as possible. Here, we strike other snags in the smooth working of the consortium, as we find that the two lines in Shantung surrendered to the consortium by the Japanese group are handicapped at the outset by a loan of $20,000,000 advanced by Japanese bankers to the Peking government on the security of these lines. These funds were dissipated by the Peking government in internal warfare, so the lines must now be saddled with this extra cost at the outset of any final negotiations, thus diminishing legitimate returns from the larger investment necessary to build them. If the main Shantung line had been handed over to the consortium instead of being returned to the Chinese government, these extensions could have formed part of the main system and the extra financial load of $20,000,000 more evenly distributed. Forming part of the Shantung Railway, under one management, the loan for building the two extensions would have materially increased the capitalization of the main line, without any undue strain on the earning capacity of the system. In this question, the Japanese lost a most valuable point at Washington, and at the same time, made the task of the consortium more difficult. As it is, the Chinese get possession of the main line of the system, while the important branches pooled in the consortium must stand on their own bottom and carry the interest load of a $20,000,000 advance, in addition to their actual cost of construction. Under these conditions, the financing of these extensions under the consortium may encounter difficulties, not only in negotiating a final contract with the Chinese government but in issuing the bonds afterwards. Much will depend upon the terms China is willing to agree to, and the extra burden may call for special terms if the lines are ever constructed.

On the other hand, Americans, especially the American International Corporation holding the Siems-Carey contracts, are interested in pushing through the Hankow-Szechuan line and starting work on the Grand Canal. These contracts stand on their own bottom, with such terms as should permit the loans to be raised at any time the bond market is favorable. On all the old railway contracts pooled in the consortium, the loan terms and conditions must be revised in order to enable the floating of a new issue. Here, sooner or later, the consortium must come to the Chinese and open negotiations. The terms of the Siems-Carey contracts, however, with their twenty per cent. participation in the profits of operation, eight or ten per cent. construction profits, five points commission to the bankers, and five per cent. on the purchase of materials, with chief engineer, auditor and traffic manager to assure the proper expenditure of the loan funds and direction of operation, should be ample enough to assure the success of a loan with which to proceed with construction. The same pertains to the financing of the Grand Canal. The Japanese partners in that scheme are favorably disposed towards raising their share of any loan for immediate resumption of work, but the New York market appears to fight shy of Chinese bonds.

Even in the matter of the Hankow-Szechuan lines, a clash of interests must arise whenever the time arrives for issuing a loan for its construction. It will be recalled that the original four power consortium (in which the old American group was a partner), holds the Hukwang Railway contract which embraces the line following the Yangtze from Hankow to Chengtu in Szechuan, and that the first section of this line from Ichang to the Szechuan border was designated for the American group to construct. Considerable progress has been made by the American engineers on this section, especially in the matter of surveys, and Mr. Randolph, the American engineer-in-chief, was appointed by the group as its technical representative during the negotiations leading up to the organization of the new consortium. The old consortium, therefore, is very much concerned over its rights to the line into Szechuan, and, whenever the time arrives to seriously consider financing this railway, either the Siems-Carey project or the earlier rights acquired by the four power group will have to be scrapped. One line must go, as the consortium, will hardly care to assume the difficult task of financing two lines into Szechuan at once. The American section embraced in the Hukwang agreement is the only railway contract the American group has placed in the consortium pot. The British group claim a prior right to construct the railway into Szechuan along the route surveyed by the Siems-Carey Company, thus reinforcing their American partners in the Hukwang agreement. The Hukwang agreement itself would be seriously impaired in value by the elimination of the right to build the Szechuan line, where the French also are to construct a section. In the event the present consortium is ever dissolved, and the pooled contracts revert to their original holders, the Hukwang agreement would be shorn of much of its value if the line into Szechuan is surrendered in favor of the Siems-Carey survey, and at the same time, it would eliminate the old American group from any share in prospective railway building in favor of the American International Corporation.

So, no matter where it turns, the consortium path is beset with enough legitimate financial difficulties to discourage the most optimistic banker. Add to this, the absence of any government in China that can provide the necessary guarantees to a loan contract of any nature, and the situation facing the consortium seems hopeless indeed. In effect, the real value of the consortium at the present moment consists in keeping alive the spirit of international co-operation, and through the support of their respective governments, preventing Chinese officials from floating worthless loans through irresponsible bankers. The greatest danger confronting the consortium and China at this juncture, is that some independent banker whose prestige in the investment field at home would enable him to dispose of the bonds to the public, may enter into a loan agreement with Chinese officials. Such a loan would effectively kill Chinese credit and make extremely difficult any subsequent effort on the part of the consortium to restore confidence. All the available and surplus revenues of the country are already pledged to the hilt. There is always the danger, however, that some unsophisticated banker may listen to the plausible stories of Chinese loan brokers, and accept without investigation a security that looks good on its face, and issue the bonds to his customers. This has been done before and can be put over again. But at this time, there is no excuse for pleading ignorance of conditions, and any banker that would accept without question the securities so offered, would be guilty of a crime.

If the present situation is left to work itself out, with the interest and principal on past loans being defaulted or postponed, the day cannot be long distant when China will have to face international intervention in the control of her finances, or, appeal to the consortium for help.

Because of the huge profits attached to such loans, the Chinese Bankers' Association may advance sufficient funds for the government to eke out a hand-to-mouth existence. On the other hand, there is no serious indication that they will come to front with the funds required to redeem the Shantung Railway, or do any signs exist that their patriotism will soar to the height of saving the Kiangsi line from falling under Japanese control for defaulting the interest payments. The financial outlook is therefore gloomy, with the consortium alone standing between China and disaster.

Should conditions ever warrant the dissolution of the consortium, the consequences can have little bearing upon China's political status. The Washington conference provides guarantees against territorial aggression for ten years at least, and in that time, the more sanguine friends of China believe that she will be well able to take care of herself. Drop the consortium and the consequences reduce themselves to a simple reversion of the pooled contracts and concessions to their respective holders. With all political and territorial phases of these concessions eliminated as a result of the recent treaties, they must be treated on their merits as business propositions. It goes without saying, that under these conditions, the Chinese government will never submit to being coerced into signing a final agreement for the execution of such concessions, as may have been extracted in the past through severe diplomatic pressure. Under this category would come some of the British and French concessions, as well as the Shantung extensions, originally forced from China by Germany, inherited by Japan and handed over to the consortium. The failure of the consortium therefore would simply deprive its pooled concessions of all commercial value. It is folly to assume at this date, that any government would invite world-wide criticism in supporting these concessions by means other than peaceful diplomatic correspondence.

The real danger from a dissolution of the consortium would arise from a renewal of the jealousies and rivalries incidental upon the opening of the field to independent wild-cat finance. Experience teaches us that the average Chinese official with no knowledge of previous committments, or caring less, if he did know, would unhesitatingly enter into new contracts infringing rights previously bartered away, for the sole purpose of obtaining as much bargain money as possible, or, for the more common Chinese object of creating international friction. Here we have a real menace which must be guarded against in the future. Such tactics on the part of Chinese officials encouraged by irresponsible foreign advisers created the situation that compelled the creation of the present consortium as the only way out of a dangerous tangle. The crude attempt in 1916 to force the United States into a show-down with all the allies on the "open door" doctrine at a time when they were fighting for their existence, ended by effectively closing the Chinese railway field to American capital, and compelling the formation of a new consortium as the only way Americans could enter the field at all. What happened before, can happen again if the field is thrown open to independent and irresponsible exploitation by the failure of the consortium. This is the real danger.

There is one more angle to a possible dissolution of the consortium, that should be of special interest to Americans. Drop the consortium, and under the Washington treaties, the Chinese investment field is automatically opened to all. But will American capital take advantage of this opening? We doubt it. The one feature of the consortium that appeals most strongly to American bankers is the international guarantee that the investments will receive adequate diplomatic support. It is the one strong selling argument that assures public subscription to the bonds. The American bond-holder has learned that he cannot always rely on his government for other than ordinary diplomatic support for the protection of his foreign investments. As a consequence, he is remarkably timid in purchasing the bonds of any country whose interior political conditions are chronically unstable. He knows for a certainty that public opinion will never support his government in employing the persuasive measures of other powers in the event of a default of interest or principal. A long-term American loan to China, at this juncture, without a guarantee of something more tangible than the support of the state department would be most difficult to float in America. The four-power guaranty attached to a consortium loan, however, raises a Chinese bond to the ranks of a gilt-edged security.

It is for these reasons that the success and continuation of the consortium must appeal strongly to Americans. If we admit that public opinion at home will refuse to support the American government in employing force for the collection of repudiated or defaulted foreign securities, long-term loans to China for some years to come, will be possible only through the medium of the consortium, the one safe guaranty to the bondholder that his investment will be protected.

With the disappearance of spheres of influence and all danger of territorial aggression through railway and other concessions eliminated as a result of the Washington conference, and the creation of a board of reference to make the "open door" a practical rather than a theoretical doctrine, there remains another important consideration that must be faced should the consortium be dissolved. With the menace of territorial aggression removed, the Chinese might be willing to grant concessions to foreign capital along lines that have proved so successful in developing other backward countries. Sooner or later, under new political conditions, a stabilized China must effect a radical modification of its ideas on concessions if foreign capital is to develop the resources of the country on terms that will assure profitable returns over a period of years. The concession is only another name for a franchise, which, in various forms, has attracted foreign capital into Latin American countries without in any way impairing their sovereignty. Once China is united under a stable government at Peking or elesewhere, it would seem that the results of the Washington conference will create a loop-hole through which the Chinese may avoid dealing with the consortium by granting concessions for the development of their public utilities, which the governments behind the consortium groups would find most difficult to oppose. In the competition for development loans, China may be compelled to accept the commercial concession granting rights of full ownership and operation over a period of years to foreigners, in order to attract capital. Americans might fight shy of such propositions because of the uncertainties surrounding the internal political situation during the next decade, but would all other nations be

as cautious? The scramble for concessions, should the Chinese adopt such a policy, would tax the powers of a board of reference to maintain the "open door" for all. It goes without saying, that concession terms that might be satisfactory to capitalists of one nation, would be rejected by the more cautious American investor, or, *vice versâ*.

It is also clear that jurisdiction over many of the most profitable public utilities must remain under the municipalities and provinces, absolutely free from interference on the part of the central government, a circumstance that would tend to materially complicate the Chinese investment field, and open up a scramble for concessions in which the most valuable would undoubtedly be snapped up by wild-cat promotors. A "Battle of Concessions," such as markered the period between 1898 and 1900, might well result from this condition, and create intense international rivalries and jealousies, such as are prophecied by Sir Charles Addis, but we fail to see how this would in any way affect the political situation after the very precise understandings arrived at in the Washington treaties. The value of the consortium under such conditions would seem to be in acting as a stopper to the issuance of such loans, through the concerted action of its component banks, correspondents and the brokers forming part of their bond-selling organizations. This means that it would have to constitute itself into a financial monopoly in fact, one that because of the pre-eminent position of its groups in their various countries, would enable it to exert sufficient pressure upon outsiders as to nullify their attempt to issue these independent Chinese loans on their respective markets.

These arguments seem to exhaust the case for the consortium, and we can now turn to a partial analysis of why it has failed to win the confidence of the Chinese, for which there must exist excellent reasons other than those put forward to explain the reluctance of the Chinese to recognize it. The consortium incurred the suspicion of the Chinese from the outset. The Chinese made an honest and earnest effort at Paris to pave the way for the success of the new combination, but were thwarted by the views of state department officials directing the negotiations.

At that time, the writer acted as secretary to the Chinese technical commission headed by Mr. Yeh Kung-cho, then in Paris for the purpose of keeping in touch with the organization of the consortium in order that its work might be facilitated and its plans accepted by the Chinese government who recognized the need of proceeding without delay to the construction of much needed trunk railways. I have refrained from making public the Chinese side of the case, but as many books and magazine articles bearing on the Paris conference have been written by others, I can be excused for throwing additional light on these controversial matters.

As I seek no favors from either the Chinese government or the consortium, I can speak freely without being misunderstood or misinterpreted, my sole object being to throw light on an administration, which, to quote the words of Elihu Root, was "incompetent to originate any policy for itself or carry one out if drafted for it by others." The facts herein disclosed will, at this late date, convey to friends in the Japanese, British and French foreign offices, and group financiers in Tokyo, London and Paris, that I faithfully endeavored to carry out a program for mutual co-operation, which met with their heartiest approval and support, at a time of great international stress.

The task of calling an international convention to straighten out the Far Eastern muddle, which the past administration compromised itself on four different occasions to perform, has devolved upon President Harding, Secretary Hughes, and other far-seeing statesmen. Saved from the possibility of war with Japan, the American people are now looking forward to an era of peace, harmony and co-operation in the Pacific, with China's territorial integrity strengthened and safeguarded by a series of treaties to which all interested powers have subscribed. There is one task, however, started by the last administration which remains unfinished. Wilson, Lansing and Reinsch created the consortium. It is left for Harding, Hughes and Schurman to make it work. Perhaps the information outlined in the following pages, will help clear the way towards a solution to this problem.

G. B. R.

The Background of the Consortium

China's Repeated Efforts to Break Down the Spheres of Influence and Solve her Problems in Her Own Way Thwarted by the Wilson Administration

A PERSONAL NARRATIVE

By George Bronson Rea

IN 1912, Dr. Sun Yat-sen received full powers under a presidential mandate signed by Yuan Shih-kai, to organize a national railway corporation, design a national system of railways and negotiate with foreign bankers for their financing and construction. I was invited by Dr. Sun to accept the position of technical secretary to this corporation, and, after assisting him in designing a practical scheme of 10,000 miles of necessary trunk lines, was commissioned to proceed abroad as deputy director general with full power of attorney to initiate negotiations for its financing, preferably under some international financial combination that would take the railways out of politics and eliminate spheres of interest. On arrival in London, in January 1913, the scheme was presented to Sir Charles Addis, head of the British group in the consortium, whose response was that he would take over and finance every mile of railway Dr. Sun had to offer. He arranged a meeting with the engineers of the British and Chinese corporation at which the details were to be discussed. At that time, owing to the inter-group agreement, in made no difference which of the groups signed the preliminary agreement, as all Chinese business was shared equally. Notwithstanding this, at the solicitation of Mr. Willard Straight, then representing the American group, I decided to give Americans the prestige of signing the preliminary agreement, in order that our own group would have something tangible in the general consortium pot, and assure to American manufacturers a market for railway supplies. Postponing further talks with the British group I sailed for New York, arriving there in the latter part of February, 1913, about ten days before the change in administrations. The American group would do nothing until the policy of President Wilson on these matters was made clear. This he did in no uncertain manner within two weeks after assuming office.

Repeated appeals to support the American group in the construction of necessary railways, in combination with the other groups in the old consortium, proved futile, Secretary Bryan de-

claring that he could not endorse a Wall Street monopoly and recommending that I take the proposition to bankers in Denver, St. Paul, St. Louis, Chicago and other thriving Western cities, who, he declared, would be most anxious to take over any large Chinese loan. The situation was hopeless. With the American group outside the consortium, it became impossible to adhere to the original plan of financing the scheme as a whole with an international group and so eliminate the spheres of interest. Despairing of moving the president or the secretary of state from their position, it became necessary to break the scheme into individual contracts, and again, in order to assure full American participation in the development of China, I proposed to Mr. Straight that the American group take over a preliminary agreement for what was called the South-western Trunk System of over 3,000 miles, at that time free from international complications. No advance payments were asked or required. All the American group had to do, was to sign a preliminary agreement and place it in "cold storage" against such time as conditions would enable it to be financed. Even this was rejected, the bankers declaring they would have absolutely nothing to do with China, until such time as the president modified his attitude and requested them to re-enter the field. This was the last opportunity presented to American capital to participate in China's railway development with contracts absolutely free from international political complications. In his zeal to humble Wall Street and pave the way for his federal reserve system, President Wilson, not only closed the door to American development of Chinese railways, but prevented China from eliminating the spheres of interest in her own way and on her own initiative through international co-operation.

Thoroughly discouraged, I proceeded to Europe and unable to resume negotiations with the British group, split the scheme into individual contracts offering them to various world-known contractors in London and Paris. The Pauling contract for the Canton-Chungking line was arranged for, with four other contracts aggregating 4,000 miles of lines under way on the same terms, when the second revolution broke and Dr. Sun's powers were annulled. Returning to China, and explaining the situation to the government at Peking, I was requested to design another national railway system more in harmony with the ideas of the northern authorities for strategic control of the country. This program was then adopted as the basis of a new scheme for eliminating spheres of influence through international finance. I was appointed technical secretary to the ministry of communications and with Dr. Chen Chin-tao, as financial commissioner to conduct the detailed negotiations, authorized to proceed to Europe and organize a new international company for the financing, construction and equipment of the new scheme of 10,000 miles. This plan brought into the field the most reputable and experienced firms of railway constructors as principals to the contract. This international construction company was rapidly organized and a meeting held in Paris on April 22, 1914. The bankers, constructors and manufacturers of the United States, France, Britain and Germany participated equally in the organization of the company, which was to be registered in Switzerland. The greatest European financial institutions stood ready to finance the loans, (aggregating $500,000,000) to carry the scheme into effect. Chinese bankers received the right to share in the underwriting, act as depositories of the loan funds, and participate in the construction profits. The terms agreed upon, 13 per cent. on the financing and cost of construction, were two and a half per cent. less than those allowed by the American government for the financing and construction of the Philippine railways. It was for all practical purposes a new construction consortium called into being, by the Chinese government, to finance and construct a limited scheme of 10,000 miles of new railways, in which Chinese banks were permitted to share in the underwriting profits and Chinese capital brought into the construction companies, with an approximate participation of twenty five per cent. in the shares and profits.

The American participant, Messrs. J. G. White & Company, were not represented at the meeting, and it was voted to hold open their quarter-share in the enterprise until such time as they could guarantee the raising of their proportion ($125,000,000) of the loans. The British, French and German constructors had made all necessary arrangements for their groups to finance their obligations before accepting the offer of the Chinese government. In the meantime, the American company approached the state department to ascertain its attitude towards the scheme. The following official letter signed by Mr. Robert Lansing speaks for itself :—

DEPARTMENT OF STATE WASHINGTON

May 16, 1914.

Messrs. J. G. White & Company

43-49 Exchange Place

New York

Sirs,

I have to acknowledge the receipt of your letter of May 9, 1914, enclosing a copy of letter addressed by the President of your company to Dr. Chen Chin-tao.

In reply to your enquiry as to the attitude which this Government would take towards an enterprise of the character proposed by Dr. Chen, that is to say the organization of an international construction for the financing, construction and equipment of future government railways in China, I have to state that the information furnished the Department seems to indicate an intention on the part of the Chinese Government to grant the proposed company a monopoly of railway construction in China. If this understanding be correct, the proposed plan would appear to be in violation of treaty provisions which forbid the establishment of monopolies.

The Department is earnestly desirous of promoting the extension of American trade in foreign countries by all proper means, but cannot give its support to any enterprise which implies an exclusive right upon the part of any one company or group of companies to build and equip railways in any part of the world.

I am, Sirs,

Your obedient servant,

For the Secretary of State,

Robert Lansing,

Counselor.

It is true that the British government also withheld approval until the scheme was officially submitted for its scrutiny. On receipt of this remarkable communication, I hurried to explain that the company had been called into existence by the Chinese government, for the express purpose of internationalizing the railways and eliminating spheres of interest, and, that a contract for 10,000 miles was well within the right of the Chinese government to enter into, as because of its size, assuring a long period of activity for the bankers and constructors, it enabled China to obtain the lowest possible terms. This communication was never acknowledged. However, I was surprised to learn later on, that another state department official informed the representatives of J. G. White & Company, that it was not so much a question of monopoly that bothered the department, as the fact that joining with other nations in the construction of Chinese railways, would involve many difficult international problems which the American government would wish to avoid as far as possible. This seemed to indicate that motives other than those appearing on the surface, were responsible for this remarkable attitude. However, it is only necessary to emphasize at this point, that what was qualified as highly illegal and in violation of the treaties in 1914 when initiated by the Chinese government, became a most praiseworthy and legitimate international

policy in 1918, after the situation had become so confused that international co-operation through a new consortium became absolutely essential to avoid more serious complications.

On learning the above facts, the Chinese government in July, 1914, ordered a temporary suspension of the negotiations. They were never officially cancelled, and the European participants, after consulting their legal advisers, took the position that their rights in any future reopening of the matter had been firmly estalished. The war intervened, but the rights of the company remained. On my return to China, the high Chinese officials concerned fully concurred in my views, and it was understood that the scheme should be held in abeyance pending a favorable opportunity to resurrect it. That opportunity never arrived, as Minister Reinsch, anxious to do something practical, personally intervened by proceeding to New York the following year to encourage the formation of a new American combination headed by the Siems-Carey Company to enter the field. When the details of the Siems-Carey contracts finally leaked out in Peking, I realized that a great blunder had been made, one which would result in foreign opposition, diplomatic protests and a closing of the field to American capital. The mere fact that the issue of the open door had been raised with the four allies at the same time while they were struggling for their existence in Europe, gave the contract all the ear-marks of an attempt to create friction between America and the Allies, and so redound to the diplomatic advantage of Germany. I reasoned with the contractors, and told them the lines specified would never be built. I placed the facts before Minister Reinsch and was informed by him that "everything had been most carefully considered in advance." When two months later, on the publication of the terms of the final agreement signed on September 27, 1916, the state department declared that it had no official knowledge of the contract, it placed the responsibility squarely up to Peking, and indicated that Minister Reinsch had concealed the facts for four months from the state department in order that the government would have to face the issue. I saw that it would be impossible to support such activities, and as my usefullness with the Chinese in solving their railway problems had been terminated, I determined to leave China and concentrate my efforts towards bringing about international co-operation to avoid more serious complications. The protests of the Russian, Japanese, British (and the subsequent attitude of the French towards the Siems-Carey contracts) told me that the only way left open for American capital to enter China, during the period of the war, was through co-operation with other powers.

I explained my ideas carefully to Sir Bielby Alston, British Chargé, at Peking and to my Chinese friends, who approved of them, and then visited Tokyo to ascertain the attitude of the Japanese government towards such co-operation. Here I was informed by Baron Motono, through Mr. Inouye (now governor of the Bank of Japan), that as Japan held special political and other interests in Manchuria, the Japanese government could not approve of any international scheme, which, although proposed in the utmost good-faith, might conceal a revival of the Knox neutralization plan. They recognized, however, that they had no special rights or position in China proper, and would not oppose any plan for American co-operation in concessions held by their allies, in fact, they thought that cooperation at such a time would strengthen the morale of the Allies. The Japanese, on the other hand, welcomed American co-operation in the development of Manchuria in order that the two nations might work in harmony in this sphere and dispel all causes for misunderstandings.

I then proceeded across Siberia and after an interview with the officials of the Russian foreign office on their position in Mongolia, arrived in due time in London, and later in Paris. In both capitals I fully explained my ideas on co-operation to the leading bankers interested in China and to the officials of the foreign offices. These views were received with great sympathy and approval with the expression of hope that American cooperation with Britain and France in China could be brought about as soon as possible in order to consolidate mutual interests and policies in that country. Both the British and French foreign office officials with whom I conversed, were deeply solicitous in those darkest days of the war, about the trend of American activities in China, which seemed to indicate an intention to raise issues at a time when neither country was in a position to properly defend its rights. Any plan of co-operation in China that would bring America into line with them, would receive their cordial support. With these assurances, I hastened to the United States, arriving two days after the declaration of war with Germany. I laid my plans and ideas before Secretary Lansing, and at the latter's request embodied them in a memorandum. This memorandum follows, and it will be seen that the plan therein outlined, subsequently served as the basis for the new consortium, but expanded in order to meet the new situation arising out of Japanese military activities in China.

For a better understanding of the following memorandum, I might state that when the Japanese presented the twenty one demands to the president of China in January, 1915, Mr. W. H. Donald, then editor of THE FAR EASTERN REVIEW, residing in Peking, was requested by the Chinese authorities to undertake the publicity campaign that would disclose to the world the full import and extent of this *demarche,* and it devolved upon myself to take charge of this work in America while Mr. Donald remained at Peking in direct touch with events. When China found that she had to accept Japan's ultimatum and sign the treaties, I received a lengthy telegram at Washington from Peking, requesting me to see the secretary of state and obtain his promise that the American government at the expiration of the war, either at the peace conference or a separate international convention to be called for that purpose would have the whole question of China brought before the world, in order that her case could be fully presented. Mr. Lansing, in effect, informed me that this was the policy of the administration and gave me permission to so inform Mr. Sha Kia-fu, the Chinese minister at Washington for the information of his government. Later on, in July of the following year when the Russo-Japanese alliance was announced ; in August of the same year, in connection with the further demands of Japan upon China arising of the Chenchiatun incident, and once more in October when the Siems-Carey contracts were protested by the powers, the state department publicly declared its intention to refrain from facing any Far Eastern issues, until the termination of the war, when, at the peace conference or at another special convention, the whole case of China would be taken up and her status defined for all time. With an intimate knowledge of these declarations always before me, I assumed that the administration really had a fixed policy, which explains that part of the memorandum advocating a *temporary* solution of China's problems pending their final adjustment at the peace conference.

MEMORANDUM

A TEMPORARY SOLUTION OF CHINA'S RAILWAY PROBLEMS

Submitted to the Honorable Secretary of State, June 23rd, 1917.

I beg to submit the following suggestions for a temporary solution of these problems, pending a final decision as to the status of China at the *post bellum* peace conference.

You are familiar with the details of the present international political tangle in China precipitated by the American railway contract which raised the issue of the "open door" with the four allies—Great Britain, France, Russia and Japan—at the same time, and you will sense the fact, that notwithstanding the unquestioned purity of motives on the part of the American company, the allies have good reason to suspect that the issue was raised for the purpose of complicating the international political situation. As the state department has publicly placed itself on record that for over four months, it had no official knowledge of the details of this contract, this throws the responsibility for raising the issue upon the officials of the American company.

Such being the case, it should be reasonably apparent that our allies will not be disposed to hold any great friendship for those who precipitated the issue, and, although they have to depend upon us for financial and other support at this time and are reluctant to criticize, it is logical to suppose that they will passively, at least, oppose any further muddling of the situation in China by the selection of other railway lines for Americans to finance and construct, until a disposition to find an amicable solution is mainfested.

The situation at present is that the American contractors having simultaneously raised the issue with the four allies, and having seen their original five lines protested and cancelled, are now negotiating with the Chinese to obtain in substitution and in conformity with the terms of their contract, other profitable lines for exploitation. Obviously, the only lines they will be permitted to select, are what the other powers designate as "buffer lines," or lines between spheres, beginning nowhere and ending nowhere, and whose acceptance by the Americans can only tend to further complicate the situation, by emphasizing the "Spheres of Influence," which, in the end, must embarrass the American government in defending its traditional policy of the "open door." In plain words, the American company will not be permitted to select profitable lines to supercede those that were protested, and, after the refusal of the American government to support the lines originally specified, the Chinese authorities will hardly dare to concede others which may result in further protests at this time.

The situation is further complicated by the fact that the American company has received terms which make it impossible for the European concession holders to finance their own contracts in America. Although the terms are equitable and the contractor is fully justified in asking for and obtaining every legitimate profit as a business proposition, a situation has been created which now calls for a complete revision of China's outstanding railway contracts, covering the construction of 10,000 miles of lines and involving foreign loans aggregating $700,000,000, and incidentally imposing an additional burden of many millions on the Chinese taxpayer. The only possible manner in which these new railways can now be financed lies in the extension of the American terms to all the other contracts, thus conceding terms to the Europeans, which will leave sufficient margin of profit to enable them to raise the funds in the American financial market. As the Chinese government is already compromised to concede the most favorable terms to new German and Japanese lines, the other interested powers, must, in self-defense, and when the time is opportune, demand the extension of the same terms to cover their own contracts.

The situation, then, is this: The American contract precipitated the issue of the "open door" with the four allies at the same time; Great Britain, France, Russia and Japan incline to the belief that it was a German trap, into which the Americans walked with their eyes open; the official European concession-holders cannot finance their contracts in America unless conceded the same terms as the Americans, or better; they are not willing that the American company be permitted to further complicate the situation by selecting other lines; the Chinese authorities will not dare specify other lines which traverse the so-called spheres of special interest; the allies are estopped from openly voicing disapproval at this critical time because of their dependence upon us for financial and moral support in the conduct of the war; they are naturally disinclined to seek or accept terms from any official financial combination, and would rather have the problem approached as a whole so that an amicable solution can be found, acceptable to all interested parties.

The European financiers must rely upon American co-operation to comply with their contracts in China, and to do this, must receive terms equal to the American contract to enable them to obtain this financial support upon a business basis. As long as no effort is made to find a common ground for co-operation, the interested powers can hardly be expected to surrender what they still consider as their special rights and privileges in their respective spheres, nor is it reasonable to suppose that they will permit the Chinese authorities to select further profitable railway concessions within these spheres for Americans to finance and construct until a satisfactory solution is found.

It must be remembered, that previous to the war, American bankers were unable to float loans in America for the development of Chinese enterprises; and, in various past transactions, the major portion of their participation in these bond issues has been subscribed to by the London and Paris markets. It should also be kept in mind that, rightly or wrongly, the British and French feel that the wealth that has rolled into our coffers since the outbreak of the war represents their life-blood, and that it is this wealth that now enables us to seek concessions in China. Relying on our high sense of honor and justice, they therefore cherish the hope that in any American scheme for co-operation in China, they should have the preference, and, while for obvious reasons, they may not openly voice their disapproval at this time (human nature being very much the same the world over) they must view with deep concern the recent arrangement of an American corporation in co-operating with Japan, while our financiers show no disposition to reach some amicable adjustment with themselves.

If the so-called "Spheres of Influence" in China are to be abolished and American capital permitted free scope to obtain valuable railway concessions in disputed territory, it would seem reasonable to suppose that the other powers will be loath to surrender their pretensions and rights at this time, unless some genuine spirit to co-operate with them is manifested by American financiers.

Exclusive of the American contract for financing and constructing 1,500 miles of railways, the Chinese government has compromised itself to the further construction of 10,000 miles of lines with the other powers, of which approximately 7,000 miles are under contract to British, French and Belgian interests, the loans for which have still to be raised when conditions permit. These 7,000 miles of railways will call for, under pre-war costs, approximately $400,000,000. It is manifestly impossible for this amount to be raised in Europe immediately after the war; and, if the lines are to be built at all, the financing will have to be spread over a period of from ten to fifteen years, calling for an annual installment of from $25,000,000 to $40,000,000 for investement in Chinese government railway bonds. This will probably be as much as the markets can absorb. This total might be materially reduced by the elimination of certain sections of the difficult Belgian lines and brought down to about $300,000,000 and spread over a period of ten years. It would be extremely difficult, if not impossible, to raise such a loan at one time for the development of Chinese railways; besides, it would be unnecessary. It is generally estimated that if a Chinese railway proposition is assured of $5,000,000 a year for construction and other expenses, work can be pushed ahead without any fear of financial difficulties.

This being the case, if we take three British, one French, and one Belgian contract to finance, these will call for an annual investment of $25,000,000 in Chinese government railway bonds for the next ten to twelve years, to see these five propositions through to completion. The question therefore arises; is it not better for the American government to use its good offices with its own financiers and persuade them to guarantee the annual investment of $25,000,000 for the next ten or twelve years in Chinese government railway bonds, so as to permit the British, French and Belgians to comply with their obligations in China? Is it not better to make this safe and conservative investment, rather than face the possibility of further serious complications arising out of these railway concessions in China? In other words, is it not best, for the higher interests of the nation, for the government to recognize the present situation and the drift of events and use its influence to have this sum invested as an insurance against possible war, and so amicably settle the Chinese railway problem in such a way that all can work harmoniously together, and take this ever-recurring irritant out of the scope of dangerous international politics? If a disposition be manifested at this time to co-operate with the others, is it not reasonable to suppose that there will be an immediate breakdown of the "Spheres of Influence," and American capital permitted a clear field in China for profitable railway investments?

It may be urged that this is solving the difficulty with the dollar and unbecoming our dignity as a nation, but against this we must recognize that conditions have changed and our bankers must now take over the financial load that London and Paris carried before the war, and reciprocate and co-operate with the others in China. This co-operation must come as a natural result of changed conditions, and no one combination of American capitalists should be permitted to preserve a financial monopoly in China and dictate the terms to the others in such a delicate international problem.

I have refrained from mentioning co-operation with Japan, taking the reasonable position that Japan has accumulated enough wealth out of the war, to enable her to finance her own undertakings in China. It seems unnecessary also to include Russia, for the reason that the only Russian railway concession in China is purely political and Russia is in no hurry to utilize it at this time, being content to keep it in "cold storage." Therefore, our immediate problem is to find a way to work in harmony with Great Britain, France and Belgium in China proper, and in contracts already entered into, and in which Japan has no direct interest, or reason for objection.

If, at the request of, or with the approval of the state department, a combination of American bankers, should guarantee an annual investment of $25,000,000 in Chinese government railway bonds for the next twelve years, at a reasonable rate of profit to themselves, and so permit our British, French and Belgian allies to carry out their contracts and obligations with the Chinese government and thus preserve their prestige in China, it seems clear, that, in addition to the regular banker's profits on the loans, the American manufacturers would also profit from the sale of materials, pending such time as the industrial establishments of the other countries can be reconstructed.

I feel sure that if the president or the secretary of state should approve such co-operation, the interested powers would at once modify their policies and consent to some broader interpretation of their special agreements with China which now restrict our independent action in the development of Chinese railways. Once there is a return of industrial activity in China, internal conditions will rapidly improve, the people will become more contented, and with employment and prosperity, there will be an end to these periodic domestic troubles which have their real origin in economic disturbances arising from the too acute struggle for existence in a densely populated agricultural country. If China is guaranteed fifteen years of respite from these international intrigues for railway concessions, and the harassed officials relieved of the constant diplomatic contest with other powers over these matters, it will enable the Chinese government to devote its whole time and attention to the reform of other pressing demestic problems, and thus make for stability, internal peace and ultimate strength.

It was this solution that I outlined to the British charge at Peking, and afterwards to the head of the Japanese official banking group (Mr. Inouye, president of the Yokohama Specie Bank) and to the officials of the British foreign office, and M. de Margery in Paris, and which received their endorsement in principle, with an expression of hope on the part of the British and French that this co-operation could be arranged before the expiration of the war, as obviously such co-operation at this time would tend to bind our mutual interests in China more strongly together. The Japanese financial interests after consultation with their foreign office informed me that they could have no objection to any co-operation between American financiers and British and French interests in parts of China outside of Manchuria and Inner Mongolia, where Japan considered she had a special political and commercial position. If such co-operation with British and French interests is not forthcoming, if no attempt is made at this time to solve the problem, how can the people of the United States expect that the governments of Great Britain, and France will wholeheartedly support our present policy in China?

Naturally, if a solution is to be sought, the first move must be made at this end, and a basis found upon which American bankers will consent to raise the annual allottment of $25,000,000 for investment in Chinese railway bonds. This is not a question of issue price or interest, but simply the amount of underwriting profit the bankers will require to handle the bonds. The interest and issue price, especially the latter will be governed by market conditions at the time the various installments of the loans are issued and, after approval by the Chinese government. Once the profit desired by American bankers is determined, and a reasonable profit on the construction of the lines and the purchase of materials is provided for the European concessions holders, the plan must be taken to Peking, and presented to the Chinese parliament, so that they can have the final voice in the revision of the old contracts and decide upon suitable terms for the British, French, Belgian, Japanese and Russian contracts. It being understood that by reason of their special understandings with the Chinese government, the Japanese automatically receive the benefit of the most favorable terms to cover their engagements.

The first step must then be made in the United States, and in my judgement, it is a matter of such extreme importance to the future of American prestige in China, that the arrangements should not be left entirely to financial interests, whose energies are now concentrated on finding lines on which they can start work and issue their own bonds before other loans are placed on the market. It is decidedly a matter in which, for the preservation of American prestige in China, and the best interests of all concerned, the state department is called upon to take action and lead the way, in order to avoid further misinterpretation of our policies.

I make the above statement advisedly, for the reason that the only justification the Chinese have for reviving foreign participation in the profits of state railways is because they were led to believe the United States would protect the lines specified in the contract and defend the "open door" policy. A high Chinese official admitted to me that as the American minister had been instrumental in organizing the new American combination and acted as its sponsor, the Chinese authorities had every good reason to assume that the minister acted under instructions from his government, and the United States would now defend the "open door" policy. It was for this reason, and this alone, that the Chinese were willing to *pay the price* in the terms conceded the Americans, terms which overturned and surrendred the one policy they had consistently adhered to for the past twenty years. To anyone conversant with Chinese politics, it is clear that no official would dare to take upon his own shoulders, without reference to parliament or the wishes of the people, the responsibility of again reviving foreign participation in the profits of government owned railways (a privilege that must now be extended to all) unless he could justify himself before the nation by obtaining some greater compensating benefit. The life of any official who would surrender the vital interests of the nation without receiving some greater advantage for the people would not be worth an hour's purchase.

The cherished state policy has been surrendered, and the terms conceded to Americans must now be extended to all other nations. The Chinese have *paid the price*, but Americans have failed to deliver the goods. Is it fair or honorable for the government of the United States to permit an American company to pocket the price, force the complete revision of all China's railway contracts and open the door for all nations to participate again in the profits and management of China's railways, without the Chinese receiving in return what they paid for, or without the Chinese people being permitted a voice in designing a new railway program? Is it fair or honorable under these circumstances, for the United States government to remain inactive while such a contract is pushed through by an irresponsible official without the people, through their parliament, having a voice in the revision of their railway contracts? If this contract is permitted to go through without reference to the Chinese parliament and the terms extended to all other contracts, and the people are saddled with additional burdens as a consequence, may it not precipitate another revolution, reacting upon all Americans in China? Is the state department willing at this time to permit a situation to endure, which can only result in disastrous consequences to American prestige in China? Are we, at this critical time, willing to permit this situation to develop into a festering sore until the Chinese become inflamed at our indifference to their vital interests, and the progressive masses turn from us as they did in 1905?

For this reason, I contend that the matter is one in which the state department must take the initiative. The prestige of every American in China hinges on the attitude of the government in this matter.

I feel certain that if the state department will take action, the patriotism of our bankers will rise to the occasion, and a way found to assist our allies at this time and so stabilize the situation while preserving intact our traditional policy in China, and demonstrating the friendly interest of our government in China's complex problems.

If the secretary of state will even unofficially signify his approval of the principle underlying the suggestion of co-operation as a solution, the way can be found to take the matter up with the leading bankers of the country, and ascertain their views.

Respectfully
GEO. BRONSON REA.
452 Riverside Drive, New York City.

(I invite attention to the fact that the above memorandum was dated June 23rd, 1917. It pointed a solution to the Chinese railway problems, which the administration, over a year later, accepted, and, with certain modifications, placed into practice. A perusal of the state department's letter of July 9th, 1918, to the American bankers outlining the conditions of the new consortium, and the further memorandum of the department to the British, French and Japanese embassies dated October 8th, 1918, will indicate that the plan outlined in the above memorandum, was adhered to in all essential points, especially in that which recognizes the necessity for the United States to carry for the time being the British and French portions of loans to China. The one feature of the new consortium not provided for was the inclusion of Japan in the partnership and the sharing of our burden by the Japanese group for carrying the other two partners. In this one respect, the department, with its more intimate knowledge of international conditions, was able to round out a finished instrument for a permanent rather than a temporary solution of these problems. It is quite clear, however, that these principles were not accepted, until every other device and strategem was resorted to in order that American capital could break through the sphere of influence doctrine and operate independently in China. Minister Reinsch made a determined fight to carry through an impossible program, but in the end, both he and the department, had to accept the principle of co-operation as the only manner in which American capital could enter the railway construction field in China and eliminate for all time the spheres of special interest. Three times in five years the plans of others for achieving this purpose had been thwarted by the absence of an intelligent policy on the part of the Wilson administration, and only when all other methods proved unavailable did it accept the principle.

In a lengthy interview with the secretary of state, I was informed emphatically that the state department had been maintained in ignorance of the existence of the preliminary Siems-Carey railway contract signed in May, 1916, until the final terms of this contract were made public in Washington on October 1st of the same year. This strengthened my belief that American policy in China was being shaped in Peking without reference to Washington. Refusing to embarrass the administration at such a time with newspaper comments or criticisms, I entered the army. On the signing of the armistice, I resigned in order to accept the invitation of Mr. Yeh Kung-cho (China's minister of communications) to act as secretary to the technical commission attached to the Chinese peace delegation, and advise them on the international political complications surrounding their railway concessions and design a new pooling plan to be presented to the new consortium.

The Chinese technical commission, as well as their peace delegates, were sincerely anxious to meet the new consortium more than half-way, feeling that inasmuch as China needed financial assistance, much delay would be avoided and the dignity and sovereignty of their government upheld, if a suitable scheme for pooling their railways could be presented to the consortium as a basis for arriving at an amicable adjustment of the difficulties involved. They felt that much real progress would be made if the scheme finally accepted emanated from the Chinese government, instead of the consortium devising their own plan and forcing them to accept it. There is little doubt that had their views been considered at that time it would materially have contributed to an early success of the new financial combination, by eliminating all suspicion of its motives. The Chinese stood ready to welcome the consortium with open arms. Unfortunately, however, state department officials then in Paris, had very set ideas as to what they wanted.

I have refrained from making public the Chinese memorandum submitted to the consortium at Paris, which met with the approval of the technical commission and peace delegates as reflecting the desires of their government in readjusting its railway contracts. It was assumed at the outset of the peace conference, in fact, up to the very hour of the Kiaochow decision, that principles so loudly proclaimed during the war would be lived up to. It was assumed that henceforth all political considerations would be eliminated from these railway concessions and they could be approached as simple business propositions. Furthermore, in view of the changed financial conditions and impossibility of carrying the old contracts into execution under the terms prescribed in the loan agreements, it seemed logical to assume that the Chinese government would be permitted to exercise its sovereign power and conceded the choice of one or two procedures. It could demand their cancellation, or, it could do the fair thing and reimburse the bankers for out-of-pocket expenses, or, it could go even further and pay them half the prospective profits in order to regain complete jurisdiction over its future transportation system. With this in view, a rough reorganization plan was drafted, but the idea of purchasing concessions did not appeal to the Chinese, who, at that time, were buoyed up by the hope that President Wilson's ideals would prevail and their sovereign rights recognized under the league of nations. The Kiaochow decision shattered this dream. After careful study the plan was revised to meet this objection.

This plan was submitted to the groups, in the hope that China's wishes might be given consideration at the very outset of the negotiations, and so strengthen the position of its government and relieve it of the implied indignity of having terms forced upon it. It was felt that under the new world dispensation, some practical application would be given to the President's fourteen points and China placed in a position to assert her sovereignty. As most of China's railway concessions were extracted under severe diplomatic pressure, it was felt that under changed conditions, China would have the right to cancel them. If increased terms were to be granted, China was entitled to designate the new national railways for opening up the country. In other words, if the principles heralded far and wide during the war by spokesmen for the allied powers were to be applied, then, China as a sovereign state under the League of Nations, held the whip-hand over her future railway development. If a contract is a contract, then all these old railways would have to be built under the terms agreed upon. If not, and China was approached for new and increased terms, then she would be able to refuse, or exact reciprocatory advantages.

The Chinese position was set forth in the following memorandum:

SUGGESTED PLAN FOR THE POOLING OF CHINESE RAILWAY CONTRACTS UNDER THE NEW CONSORTIUM, FOR THE PURPOSE OF ELIMINATING SPHERES OF INFLUENCE AND RESTORING CHINA'S SOVEREIGNTY OVER FUTURE RAILWAY CONSTRUCTION.

WHEREAS; the Chinese government has in the past been prohibited from developing a comprehensive and co-ordinated system of state railways, because of the pressure brought to bear by foreign governments for the acquisition of special railway rights and concessions, in which the lines bear no relation to the legitimate transportation needs of China, in fact, in many instances designed to divert or attract the trade of China to adjacent territories or to international treaty ports outside the jurisdiction of the Chinese government, or to delimit or develop so-called spheres of political or commercial influence, and

WHEREAS; this policy has tended to obstruct and delay the proper development of the natural resources and domestic and foreign trade of the country; and in addition, by circumscribing the sovereign rights of the Chinese government to link up the remote provinces with the capital, and so impeded the central government and its military and police forces from exercising their proper functions in maintaining internal peace and order essential to the stability of the central authority and to the peace, happiness and general welfare of the people, and

WHEREAS; a situation has now been created as a result of the war, whereby the holders of railway concessions and contracts are unable to carry out their obligations under the terms of their contracts with the Chinese government, because of the inadequacy of the financial terms and conditions, and

WHEREAS; it is highly important for the welfare of the Chinese people and the foreign nations interested in the trade and development of China to build new lines of communications opening up the country to commerce and thus resulting in mutual and reciprocal advantages, and

WHEREAS; the Chinese government recognizing the fact that financial conditions have now changed, and desiring to manifest once more that spirit of justice and equity that has always characterized its business dealings with foreign countries, is disposed, on its own initiative, and as a further proof of its good will and friendship, to grant certain revised financial terms and conditions that will permit the holders of Chinese government railway concessions and contracts to comply with their obligations; it is therefore suggested, that

(1) The Chinese government will cause to be designed under a mixed commission of expert foreign and Chinese engineers, a comprehensive system of new state or national railways, with a total mileage of 10,000 miles to correspond with the total mileage under contract with foreign interests. This national system will conform to the immediate transportation needs of the country and the requirements of the central government in preserving internal law and order, and will be confined to feasible and profitable lines. This approved scheme will then be made the program for construction until the lines are completed.

(2) All holders of railway concessions will surrender to the Chinese government (or to the consortium) all their rights and pretensions, on the condition that they will receive an equal mileage for construction under the new approved system and revised financial terms.

(3) Those who refuse to pool their interests in the new consortium, or who may be refused admission by the official groups, or, for any other reason, will be given due notice by the Chinese government to comply with their obligations within a specified time under the terms of their contracts, failing which, the Chinese government in the full exercise of its sovereign powers will declare their contracts null and void. The foreign governments to whom the concessionaires owe allegiance will abstain from entering any protest or exerting any pressure on the Chinese government to protect the contracts from being cancelled.

(4) In consideration of the new and revised terms to be conceded by the Chinese government for the carrying out of uncompleted railway contracts, the various foreign governments will abrogate and declare null and void all special railway agreements promises and rights that are in any way incompatible with the dignity and sovereignty of the Chinese government, or its full liberty of action in building railways within its jurisdictional borders. This refers to secret and other agreements entered into between the foreign governments and the government of China circumscribing the latter's authority or granting special privileges to the former; to the secret and other agreements entered into between the foreign governments or their official financial groups defining or delimiting their respective spheres of railway activities in China, and to such clauses in existing or completed railway loan agreements which operate against China building extensions or branch lines.

(5) On the restoration of full sovereign rights in the matter of future railway construction, which is otherwise provided for in the charter of the league of nations, the Chinese government will enter into a binding agreement with the foreign powers concerned, to refrain from granting further railway contracts or concessions for a stated period of years, or during the time necessary to finance and complete the approved national system. It is understood that Chinese capital will have complete liberty in financing and constructing feeders and branches to the main system, and to be permitted to participate in the construction of the main lines.

(6) The Chinese government will then enter into a contract with the international consortium as called into being by the invitation of the American government, or, with a special international railway financing and construction consortium as the case may be, for the financing and construction of the entire scheme of approved railways. In the proposed consortium, Chinese capital is to be conceded an equal participation in the shares and profits of the construction end.

(7) In view of the fact that the Chinese government has entered into contracts with various American and British interests for the building of railways on a fixed percentage of profits over the costs of financing and construction, and to equalize the conditions of all the contracts under the proposed revised terms, the contract for the approved national system will be of the type known as a percentage contract, in which the Chinese government will pay to the banking consortium, or, to the international financial and construction Company, a fixed percentage of profits over and above the actual costs of financing and construction.

Such a contract may follow the general lines of the similar agreement entered into between the American government and the Philippine Railway Company for the financing and construction of railways in the Philippines, where the company was allowed a fixed profit of fifteen and a half per cent., over the cost of financing and constructing the lines, or, the contracts between the Chinese government and Pauling & Company providing eleven and a half per cent. or that of the Sims-Carey contract, or, preferably, the conditions agreed upon in Paris in 1914 for the financing and construction of 10,000 miles of new railways under an international financing and construction company, in which the lines were to be built and financed for a total profit of thirteen per cent., including Chinese participation in the shares and profits of the construction end.

(8) All the railways contracted for under this scheme will be Chinese government owned and operated lines, built/from the proceeds of Chinese government loans, secured by a first mortgage on the physical property and earnings of the lines, and guaranteed as to interest and principal by the general revenues and good faith of the Chinese government.

(9) The usual guarantees for the proper expenditure of the loan funds and the protection of the Chinese government and the bondholders will be given, such as the appointment of engineers, chartered accountants, traffic managers, etc., along the lines of the Pauling contract for the Shasi-Singyfu railway.

(10) To avoid international discord which may reasonably arise if an international organization be designated to construct and supervise any one trunk line, it is suggested that the lines in the general scheme be so apportioned amongst the members of the groups, that each national construction company shall have one complete line to construct and supply with materials. The specifications for the materials for all the lines will conform to a general Chinese government standard to be designed by an expert engineering commission.

(11) This will insure to the manufacturers of each country an equal division in the supply of materials, without having to compete with the manufacturers of all the others. It is entirely conceivable that for the next five years, or perhaps longer, the British and American manufacturers will be in the most favored position to compete for this business to the inevitable dissatisfaction of the French, Belgians or Japanese. It is also conceivable that under anything approaching normal conditions, in any general competition, the Belgian manufacturers would underbid those of other countries. In any attempt to divide the orders for materials on any one line, there is bound to be discord and confusion over the final adjustment. This is the reason why it seems most practical to divide the lines in the general scheme, so that each national construction organization will have full scope for putting into practice their engineering methods without coming into conflict with the others and of having their exclusive market for materials assured

(12) It is also suggested that as a means of facilitating construction and to avoid the losses in interest, etc., surrounding the tieing up of a large loan for any one particular line, and so utilizing to the full advantage the loans that may be annually raised for Chinese railway development, that the annual allottment of railway funds be so apportion that construction can proceed on five lines simultaneously. This will guarantee work and profits for all the national units of the international combination and bring about harmony and friendship, which cannot be accomplished under any other system.

(This suggestion is advanced because in the past, loans for the construction of a complete line have been floated at one time and lain in the banks for several years, or during the progress of construction. It is taken for granted that the average rate of railway construction in China will not exceed 200 miles on any one line annually. As it seems impracticable to attempt to construct a single railway under an international organization, due to the difference in practice and engineering methods, and the conflicts between the engineers and employees of different nationalities, it seems advisable to keep the different nationalities apart in actual construction. The best way would then be to start five lines at once, or sections of five different lines of 200 miles in length that can be financed by the annual allottment of loan funds. If we assume that the new consortium will be able to furnish loans to the extent of 50,000,000 dollars annually over a period of ten years for the purpose of completing the general scheme under contract, instead of floating the loans on the security of any one railway the security could be all the lines

in the general scheme, and the revenues from these pooled for meeting the obligations of the loans. As the general revenues and good faith of the Chinese government guarantees the loan, it seems immaterial whether the loan is raised on the security of one particular line or a group of lines.

(13) In this manner each national participant in the new railway consortium will be able to proceed along lines with which their engineers are familiar without coming into conflict or contact with the others. In other words, the individual lines of the general scheme would be entrusted to one national company to construct and furnish with materials, but would be internationalized and brought under the direction of the consortium through the loan, and after the line is constructed and in operation, in the distribution of the executive posts in the supervision of maintenance, accounts and traffic.

Paris, June 5, 1915.

In effect, this memorandum assumes that the old railway contracts cannot be carried out on pre-war conditions, and the holders must approach the Chinese government for more favorable terms. China said to the consortium and the various governments concerned, "surrender your old contracts, extracted from us by diplomatic pressure in the past, in order that our sovereign rights over our transportation system be fully restored, and then, in gratitude for this simple act of justice, we will invite you to co-operate with us in designing a new national system of railways, and will enter into a contract with the consortium for its financing and construction over a period of years, during which time, we pledge our good faith not to sign any new contracts that may interfere with the successful flotation of the loans required to make your task successful."

In view of the mixed character of her railway agreements, and in order to consolidate all the old contracts under uniform terms, China selected the percentage type of contract along lines similar to the Pauling and Siems-Carey agreements and the American government contract for the Philippine railways which assures that the lines will be constructed economically, efficiently and expeditiously by responsible, reputable and experienced engineers. She furthermore explains that only under some such contract can her capitalists legitimately receive a fair share of the construction profits.

The Chinese proposition deserved better treatment than it received. I am able to state that their ideas were not out of harmony with those of the French and Japanese groups, and although I cannot make such a positive statement in regard to the British attitude, I have reason to believe that they would not be rejected, because of the fact, that the identical principles had been accepted in the international company of 1914, in which the British participant, Pauling & Company, was financed by Erlanger & Company, and the Hongkong & Shanghai Banking Corporation. The opposition to the Chinese proposal, as far as I could learn, emanated from officials of the state department, who reverted to their position of 1914 and denounced the plan as "their old monopoly."

There may have existed other good and excellent reasons to account for the American refusal to consider the Chinese side of the case, pending such time as the political phases of the consortium were clarified by the adherance of the various governments to its principles. It is also easily understandable that the consortium could not function until its internal organization was perfected, but nevertheless, I hold firmly to the belief that a great mistake was committed at the outset by completely ignoring the Chinese memorandum and characterizing their solution as a monopoly, at a time when they cherished the illusion that their sovereign rights were to be firmly established and recognized under the new order of things.

It goes without saying that Mr. Lamont or his American co-workers had little intimate knowledge of the technical phases attached to the Chinese side of the case, their opinion being influenced to a large extent by the advice of others. Naturally enough, the Chinese idea of construction companies or a consortium organized on a basis that would eliminate the financiers and bring in experienced constructors as principals in their railway contracts, was bound to be knifed by those whose interests were opposed to this system. This is simply another phase of the constant warfare between the great construction companies of the world who operate on a percentage or a cost-plus-a-fixed-sum basis, and the adherants to the other system which concentrates all the power under an individual engineer-in-chief, directly responsible to the banks. Both systems have their advocates. The superiority of one over the other is purely a matter of opinion, as a rule most biassed opinion based on self-interest. The Chinese have learned that the engineer-in-chief or departmental system of building railways has many drawbacks and, in 1914, definitely embarked upon a program for building their lines under the other system. It was only natural that a program recognizing the rights of their banks to participate in the issueing of the loans, and their capital to enter into partnership with foreign construction companies would be revived when the opportunity presented, as the same group of officials who sponsored the 1914 program were again in power in 1919.

Consortium leaders are inclined to stress the point that its organization has had the good effect of developing the formation of a group of native bankers for the purpose of co-operating in the issue of internal silver and other loans, but they overlook the very important fact, that in 1914, in the organization of the international construction company, the official British, French and German groups who stood behind their constructors, conceded to the Chinese banks participation in the profits of issueing the loans, the establishment of branches of the Bank of Communications in London, Paris and Berlin with the right to act as depositories for a fair share of the loan funds, as well as the privilege of Chinese capital to participate in the construction profits. That much had been gained for China in the negotiations that were characterized as illegal and in violation of the treaties by Secretary Bryan. The Chinese gained handsome concessions from the European groups at that time, and resented the ignoring of their position when their proposition was turned down in 1919 at the peace conference.

With a knowledge of these facts it is difficult to see where the consortium can take unto itself any undue credit for forcing the Chinese bankers to rely on themselves, or for the tardy recognition of their privilege to participate in future consortium loans to their government. On the other hand it would appear to represent a determined effort on their part to oppose the new consortium for its failure to recognize the concessions gained for them in 1914. For, it must be borne in mind, that the Chinese officials who stood behind the 1914 program, are the same gentlemen who to-day dominate the finances of China through their pre-eminent positions as presidents or large shareholders in the many semi-official banks which form the backbone of the new banking system in China.

The difficulties confronting the consortium at the present time, with an important section of public opinion in the United States declaring that it has outlived its usefullness by reason of the treaties signed at Washington, should compel attention to the facts disclosed in this article. The arguments in favor of its existence overwhelmingly outweigh those in contra, and a supreme effort should be made to conform more to the spirit of the times in recognizing the right of the Chinese to propose some program that may serve to bring harmony out of discord.

Nothing that the consortium can now do will outweigh the results of the Washington conference. The contracts pooled by the various groups are not worth the paper they are written on, if the Chinese determine to hold out for the full exercise of their sovereign rights to dictate how, where and when, their new railways shall be built. This is the crux of the situation. The question of whether the lines are to be built departmentally or under the percentage system is a minor one. The Chinese say to the world, "we want our own national system of railways for the development of our country along lines that will add to our own prosperity, and not that of leased or treaty ports outside the jurisdiction of our government. Surrender your pooled contracts to us, so that our sovereignty over these rights is fully restored; give some practical evidence that the principles you loudly proclaim are to be carried into effect. In return, we will accept the proffered assistance of the consortium to finance and construct a national system of railways equal at least in mileage to the lines surrendered." This is the first step in the program. The question of how the lines are to be constructed, operated and managed are secondary considerations.

It should not be difficult for the consortium leaders to find some solution to this muddle. The last administration failed to understand the Chinese, and it is again up to the practical statesmen of the Harding cabinet to put into practice a policy that their predecessors appropriated from others and were unable to carry into effect.

If there is any sense of justice in the make-up of the present administration at Washington, the rights of the 1914 international construction company in the building of Chinese railways, calls for careful consideration. The former administration not only arbitrarily declared the company illegal and in violation of treaty provisions, but four years later, when it found that its own misdirected activities had effectively closed the door to independent American operations in China, invited the organization of another international combination to supplant it.

The future of the present consortium, as far as the construction of railways is concerned, would seem to lie along lines that will take the solution of the Chinese railway problems out of the hands of bankers and lawyers and hand it over to railway experts. The consortium has faithfully carried out the dictates of the foreign offices. It has proved its worth as a political instrument. The results of the Washington conference however deprives it of any further political significance and provides the opportunity for its critics and enemies to advocate its dissolution. If it is to succeed it must function. If it fails to function it will stand as a monument to the inefficiency of American diplomacy. Harding and Hughes saved the nation from the complete breakdown of our diplomacy in the Far East by calling the last conference. They can save the consortium and our national prestige by similar sensible methods.

The bankers have nobly fulfilled their function by paving the way. Let them now retire gracefully and permit experienced railway constructors to come to the front, complete their work and together divide the honors of success. Let the American group turn to Mr. J. G. White and W. F. Carey, to organize an American railway construction company, a guarantee that American prestige and business honor will be upheld in dealing with the Chinese; let the British group bring about a combination of the Pauling and British and Chinese Corporation interests to act for them in the construction of Chinese railways: let the French group support M. Edouard Gouin, of the Societe Construction des Batignolles, the foremost railway builders of France, and the Japanese get behind a construction company organized from the engineering staff of the South Manchuria Railway Company, with their intimate knowledge of railway construction in China, and then, when these preliminaries are completed, let Mr. Hughes call these experts to sit around a table in Washington with Yeh Kung-cho, C. C. Wang, K. S. Kwong, or other acceptable Chinese representatives. In one or two sittings the deadlock will be broken and a way found to commence construction on the much needed transportation system of China.

The consortium will be there very much in evidence standing behind the construction companies (in which Chinese capital will be admitted to a fair participation), retaining the power, but the detail work handled by men who know their business. The consortium will stand for the purpose of administrative and other development loans, but the railway program will remain outside its immediate control. The British, French and Japanese groups, have, in the past, expressed a desire to be relieved from supervision over Chinese railway construction, prefering to have the constructors act as principals and bear the brunt of settling the many petty technical questions that arise daily in the course of Chinese railway construction.

If the consortium is to function, something should be done without waiting for the Chinese to arrive at the brink of bankruptcy and compelled to accept its terms as the only way to avoid international control over their finances. Good business judgment and wise statesmanship should forsee that under such circumstances, the Chinese will feel dissatisfied and resentful. Harmony and good-feeling is highly essential to the success of the consortium.

I do not hold that the plan outlined is flawless, but imperfect as it is, it recognizes certain important facts that the last administration repeatedly ignored, until their acceptance became compulsory. There is a solution to the consortium problem in the above ideas, and if the bankers will consent to step aside while Secretary Hughes calls into conference the expert railway constructors of the consortium powers and representative Chinese engineers, a way can be found to co-operate with the Chinese in some legitimate manner that will break down their opposition and permit the consortium to function.

Geo. Bronson Rea.

Addis Advocates New Consortium Policy

Negotiations with autonomous provinces of China for the construction of railways rather than the complete suspension of activities on the part of the Chinese consortium because of the present division in the government of that country, is advocated by Sir Charles Addis, chairman of the Hongkong & Shanghai Banking Corporation, director of the Bank of England and head of the British group in the consortium. Sir Charles was the guest of honor and the principal speaker at a luncheon given by Thomas W. Lamont, of J. P. Morgan & Co., at the Downtown Club of New York on March 28.

Sir Charles also believes that despite unsettled conditions in China, which have become a bar to much of the proposed financing by the consortium, there is still the possibility of arranging a comprehensive funding loan for the conversion of the Chinese floating debt. After reviewing some of the troubling conditions which have arisen out of the difficulties between the factions of North and South China, Sir Charles said:

"In the face of all these contradictory compensatory factors what policy ought the consortium pursue? Clearly we cannot take sides in this matter, or support one political party against the other, until, we are assured that they are in the way of composing their differences and have the will to unite. I do not think the same objection would lie against a comprehensive funding loan for the conversion of the floating debt, since that would inure to the benefit of all parties, but with that exception the consortium is, for the present at any rate, debarred from undertaking government loans for administrative purposes in China.

"Indeed, I will go further and say that it seems to me unreasonable to hold up the development of communications in China while the government is engaged, it may be for a generation, involving a new political system. In my judgment the time has come for the consortium to consider the practicability of negotiating independently with an autonomous, or group of autonomous provinces for the construction of specific railway undertakings within their respective borders."

Sir Charles expressed optimism concerning a final settlement of China's internal strife. In this connection, he said:

"The process may be slow and tedious and I can understand the impatience of those who would like to accelerate it by placing China under the tutelage of the foreign powers. I can understand that policy, but I am convinced it is a chimera. In the last resort, foreign intervention implies the sanction of force, and the employment of international force in order to coerce China is not a practical policy. China must work out her own salvation. All we can do is to stand by and, in the words of the Washington conference resolution, provide China with the freest and most unembarrassed

opportunity of developing and maintaining for herself an effective central government.

"Such is the instinct for law and order, the capacity for self-government of this extraordinary people, that 1920, the last year, for which figures are available, marked a new record in their foreign trade. Last year's customs revenue was larger than ever before. In spite of the depredations of the tuchuns (military governors), there was a surplus of the salt revenue, after paying all the foreign charges secured in it, of $51,000,000, and the railways showed an estimated free surplus of $24,000,000."

Referring then to the work of the consortium formed in October, 1920, Sir Charles said:

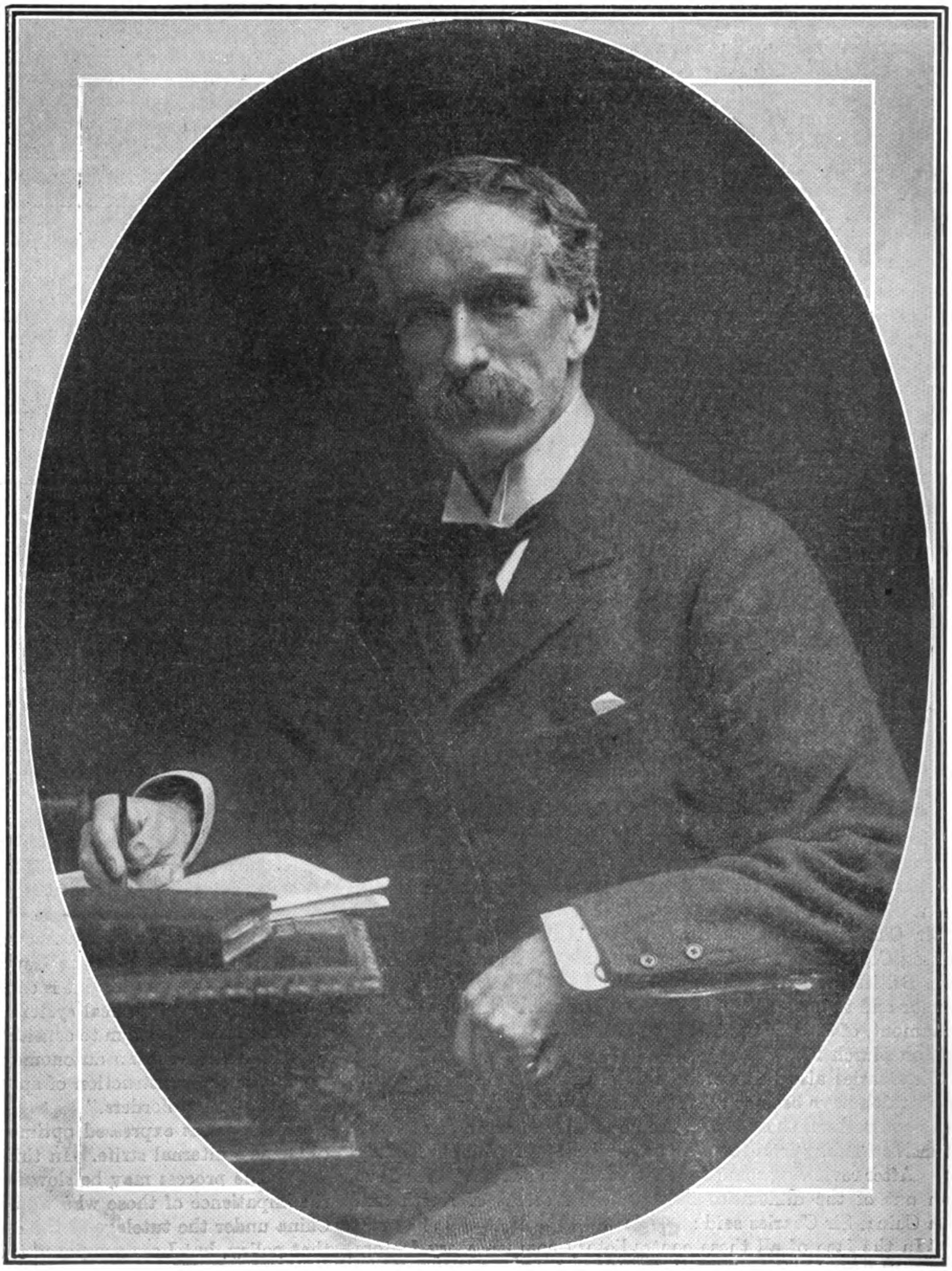
"Consider what the consortium has done, is doing, for the people in China. It has succeeded in establishing an effective check upon the senseless and corrupt government expenditure which was rapidly plunging the country into bankruptcy. I believe I am justified in saying that the profligate borrowings of foreign moneys, which were menacing the integrity of China by a system of insidious financial penetration, has practically ceased since the formation of the new consortium.

"Furthermore, acting on the principle that heaven helps those who help themselves, the consortium has encouraged and developed the formation of a syndicate of native bankers for the purpose of co-operating in the issue of internal silver loans. Apart from its economic justification, in encouraging thrift and utilizing the national savings for national purposes before seeking assistance from abroad, I attach the greatest importance to this movement as a means of giving men with a stake in the country an interest in good government and a strong incentive to work for its rehabilitation.

"It is the bane of Chinese politics, an inheritance from the old *régimé*, that they have been left too much in the hands of the *liberati*. Until we can get the business men, the men with a stake in the country, to join hands with the educated classes, we shall never secure the formation of that sane and sound public opinion, upon which, in the last resort, governments must depend for their power and foreigners for their security."

The continuation of the consortium is a factor of great importance in international affairs, in so far as they are related to the Far East, Sir Charles believes. In reference to this he said: "Drop the consortium and to-morrow the policy of spheres of interest will be revived. That is in the nature of things. Reverse the process by which the co-operation has been substituted for competition and the creditor nations will be forced in self-defense to safeguard the area of their securities.

"There is nothing except the consortium which stands between China and the resumption of spheres of interest, and no one who recalls the international rivalries and jealousies which marked the period, known as the Battle of Concessions, with all its after-



SIR CHARLES ADDIS

For Many Years Chairman of the Court of Directors of the Hongkong and Shanghai Banking Corporation, Director of the Bank of England and Head of the British Group in the Consortium. Unquestionably, the Greatest Authority on Chinese Finances and Railway Problems.

math of territorial aggression and international wrongdoing, will consider almost any sacrifice too great to avert the renewal of such a calamity to China, such a menace to the peace of the world. The consortium has justified itself and will continue to justify itself so long as we stand together. Never were its claims to your consideration and support more insistent, more clamant than they are to-day."

Personalities and Policies Among Chinese Bankers

By Joseph W. Hall

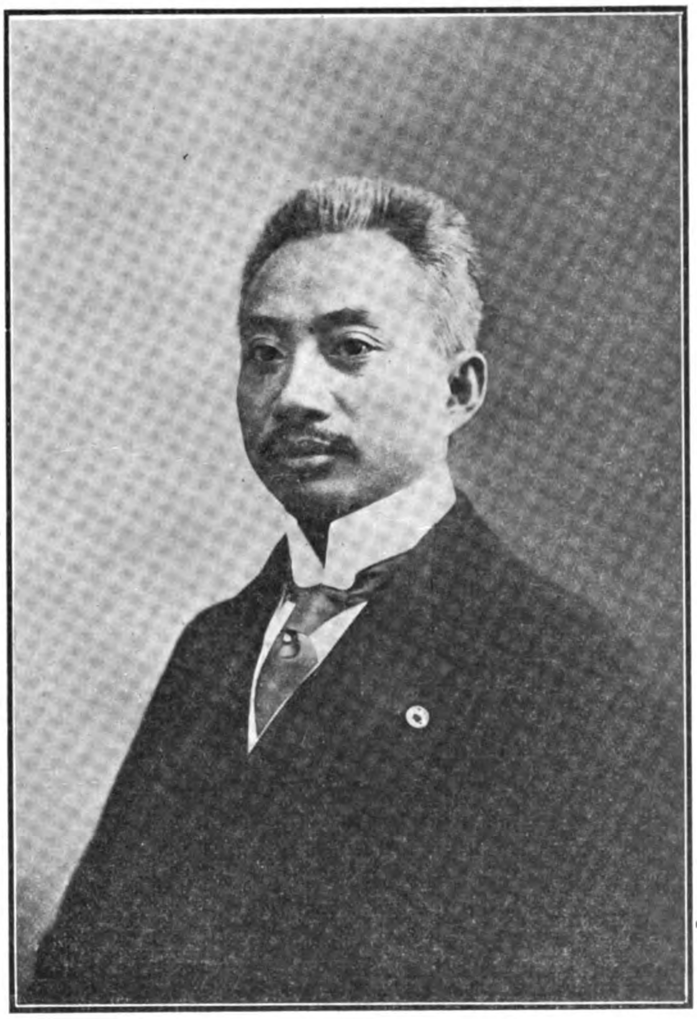
THE joint-stock bank, as developed in Europe and America, is an institution not indigenous to China but which has, since the revolution, taken to her soil in a manner so flourishing as to be almost alarming. It fits in well with the Chinese liking to keep their money in a liquid state, in which they can, so to speak, frequently pass it through their fingers. The high rate of usury pertaining in China and the profit obtained from the various unstandardized currency units makes it possible for the Chinese-controlled bank to operate under the excessively proportioned overhead common to Chinese business and yet show dividends—which indeed average around fifteen per cent. Again, in money-changing, accounting and lending the Chinese have a skill acquired through ages of experiences. There now exist a dozen "native" banks with a paid-in capital ranging from Mexican two to eight million dollars and averaging about three million, and several score more with paid-in capitals of less than two million.

Chinese bankers of the first generation, being unable to cast off the traditions of quick wealth through political power, devoted as much of their attention to the manipulation in their favor of state and federal politics as to the more praiseworthy development of the country's resources and trade. But there is evidence that already among Chinese financial leaders a more progressive generation are rising, who possess higher ideals and sounder economic conceptions, and who are taking upon themselves the burden of improving not only banking but governmental finance as well.

Of the politician type is Liang Shih-yi—because of his spectacular career the most widely-known god of the banking pantheon. Liang's recent short-lived "come-back" into official life, this time at the head of the government, was popularly described by the pun: *Tsai shen tung shen*, or "The god of wealth is becoming active." Although China's "Wealthy Gods" are many, the fortune of Liang has been attained through such boldly speculative means that to him is reserved for nickname *Tsai Shen*—the god of wealth himself—the most-worshipped dicty of the Chinese pantheon, whose image, usually in a glass case, is found in the place of honor in every Chinese shop and over the bed of every merchant.

Mr. Liang's personal appearance and address are in strong contrast to his reputation as a reckless plunger and a political

"THE GOD OF WEALTH"
Liang Shih-yi
China's most daring financial plunger and political adventurer of the Republican Era, who is the dean and leader of the first generation of joint-stock bankers developed in China. Liang has been on leave of absence without resigning longer than any Premier in history.



Tsao Ju-lin

Leader of the New Chiaotung (Railway) Clique, and President of the Bank of Communications.

Mr. Chang Chia-ao

Vice-President of the Bank of China, Father of the Chinese Bankers' Association (commonly called the "Native Consortium" in distinction from the International Group.

Mr. Feng Kun-Kwang

President of the Bank of China.

Mr. Chow Tso-min

Head of the Kincheng Banking Corporation of Tientsin, one of the leaders of the new school or second generation bankers, whose policy is soundness and affiliation with commerce and industry rather than speculation and affiliation with politics and government finance

Mr. Hsu Un-yuan

A Graduate of the University of London, Vice-President of the Chinese-American Bank; the outstanding advocate of financial co-operation with America.

Chow Tsz-chi

Closely identified with Liang Shih-yi in financial matters and large shareholder in many semi-official banks. Minister of Finance in the last Cabinet, and until recently acting premier in the place of Liang. One of China's most astute financiers and promotors.

agent untrammeled by qualms of conscience. He is fifty-two years old, of a retiring disposition, and in an interview or on the platform speaks with an air of extreme humility combined with scholarly culture. Although possessing some knowledge of Japanese he converses only in the mandarin and his native dialect. He is a Cantonese (most of China's financial and commercial leaders are southerners) of a merchant family who are the financers of many silk and produce shops in the southern ports and Shanghai. His first venture following the completion of his classical education, in which he took high honors, was the establishment of various transportation and trading companies for the exchange of peculiar local products between north and south China. In the first year of the republic (1911), as reward for his service in pursuading fellow-provincials to accept Yuan Shih-kai as president, he was made by Yuan acting vice-minister of communications. He had previously held the post of director of railways. Just at this time the struggle between Peking and the provinces for the control of the railways was in progress, and Liang took active part in encouraging the idea of state monopoly of the industry. The great opportunities for wealth to a few men in gathering into their hands the chief railway construction projects of the country did not escape Mr. Liang. With his successor in the office of director of railways, Mr. Yeh Kung-cho, also a Cantonese, he organized a "Railway Association" among the men who comprised the technical and financial management of the government railways of the time. This association saw to it that its members were liberally provided for in all railway concessions and construction projects. Liang also occupied an important position in the Bank of Communications, and so consolidated his hold on that institution that, although he was accused of almost ruining it to finance his chief's monarchical scheme, he maintained himself in the chairmanship of the board of directors. He occupies a director's chair in six other of the native banks which have been promoted in ten years of republican *regimé*.

After Yuan Shih-kai's failure Liang spent some time in Hongkong and some in Japan, where he promoted affiliations with Japanese financiers and statesmen. During this time he engaged in five large, as well as many small, ventures of a wildly speculative nature. His *Hsu Tung* Company, which exported coolies to France and was, after wide-spread protest, suppressed, lost hundreds of thousands of dollars in this venture and in rouble exchange gambling in Harbin. Not only have its shares become worthless but it has large unsecured overdrafts in native banks.

Mr. Liang has been able to maintain his financial prestige to a great degree through the Bank of Communications, in which he controls a large share of the seven-tenths of non-official capitalization and has usually had the support of the three-tenths of official shares, although these have now gone over to Chang Tso-lin. The recent difficulties of the bank, Mr. Liang's personal obligations thereto, and the growing insistence of the "younger set" in the bank, particularly in the branches, on a re-organization along better business lines, which they believe will alone save the institution, greatly threaten Mr. Liang's influence. It is probable that he as well as the class of men of whom he is the most conspicuous representative, will be compelled to retire before the new type of banker being developed at Shanghai, who relies upon modern business rather than political intrigue. The other leading figures of Mr. Liang's class are Mr. Chu Chi-chien, minister of communications under Yuan Shih-kai and confident and recent personal diplomatic emissary of President Hsu Shih-chang: Chow Tze-chi, a sophisticated old Chinese who spent a score or more of years in the consular service in America and returned to become satrap of Shantung and more recently minister of finance; Yeh Kung-cho, railway expert and political intriguer; and Tsao Ju-lin, ex-minister of finance, communications and foreign affairs, a once brilliant figure in Chinese politics who was permanently dimmed by the students in 1919. The first two are Liang Shih-yi's chief supporters in his control of the Bank of Communications.

It must not be thought that there exists an open break between the old faction and the new. The cleavage, as all cleavages in China (which is one secret of the westerner's inability to comprehend the country) is not clear-cut. The two sets of financiers are growing apart rather than breaking apart. At present, interlocking directorates and the holding by one bank, of stock of others are the dominant aspects of the Chinese banking world. More and more, however, the "old bankers" find themselves over their depth and compelled to turn their projects over to the new set, just as previously the government departments which founded many of the now existent banks, with the intention that they should be national financial institutions, found themselves over their heads and compelled to turn their projects over to the merchant politicians who have become the old banking clique.

Two influences are operating to put financial enterprise on a sounder basis. First is the urge of contact with modern business: methods felt chiefly at Shanghai; even more convincing is the repeated lesson that success through politico-speculative methods, although apparently more rapid, is ephemeral. The Chinese are by nature conservative. Here is a case where the progressives in spirit are conservatives in method, and they are bound to win.

When the new consortium endeavored to make itself felt in China, Mr. Liang put forth every effort to form a Chinese group, with himself at the head. His endeavor was frustrated by the "new bankers"—as they are popularly called—who refused to place themselves under his leadership. As a countermove the most progressive spirits, such as Chang Chia-ao and Chow Tso-min of Peking and K. P. Chen and K. C. Yeh of Shanghai organized the Chinese bankers' association for financing state enterprises under supervision. This combine has become within the space of a few months the most influential factor in native finance. Borrowing the tenets of the consortium as to close supervision of loan expenditure, it took up the government railways rolling-stock loan for six million silver dollars and soon followed this by another similar advance. The organization is of a sort that agrees with the Chinese genious perfectly, allowing the greatest freedom of action among the members. The plan of operation is of the "Lloyds" type—that is, although the group act together in floating new projects and protecting the interests of members, each particular project is considered and offered to the member banks separately, they being left free to underwrite to the extent to which their ability and inclination dictate.

These bankers, driven to adopt an attitude of hostility to the consortium by the attempt of the foreign groups to ignore them, have c-ooperated with the "old-line" faction of Liang Shih-yi to make the consortium as at present constituted forever unworkable in China. They have, however, been the first to recommend to their government the utilization of foreign capital in developing resources and state enterprises provided the same can be procured on terms acceptable to the Chinese people. This means that foreign money must wholly abandon the idea of security through available diplomatic pressure of its government upon the Chinese government. It means that all political aspects of the coming of such money to China must be negotiated through the Chinese bankers, who insist, with the backing of the people at large, on being the middleman between their government and foreign capital. It does not mean that the capitalists will be unable to procure the utilization of foreign technical experts as an assurance of efficient use of loan funds, but it does spell the death of the type of financing which has prevailed in China during the halcyon days of the concessionaire.

It means that there will be no future security for any investment other than its value as a business proposition. There are indications that at least one dominant group in the new consortium, is willing to recognize, and conform to, the new situation.

The "New Bankers" have shown their spirit by establishing bankers' clubs in Shanghai, Canton, Hankow, Tientsin and Peking; and publishing a weekly review in Shanghai and monthly magazine in Peking professing to be "devoted to economic, financial and commercial topics and banking practices in China." The Peking group naturally specialize in government finance, and are endeavoring to force business methods, for the sake of self-profit as well as

altruism, upon the ministry of finance; while the Shanghai, and to a lesser degree the Hankow, Tientsin and Canton groups, specialize in exchange and commercial credits, and general banking business as it is known abroad. There is, by the way, no north and south scism between Chinese bankers, nor between Chinese business men of other types, although, of course, the Canton and Hongkong bankers tend to confine themselves to their respective fields.

The moving spirit among the new set in Peking—and the man mainly responsible for the group loans to the Chinese government, is Mr. Chang Chia-ao—an alert, although somewhat reserved Shanghaiese slightly under middle age, who speaks English well. Of quick decision and convincing argument, he is an able committeeman. He has, through sheer ability, become vice-governor of the Bank of China, and is the active spirit in that institution, working well under the highly respected but passive governor, General Feng Keng-kwang. He is reinforced through his brother in Shanghai.

A man of Mr. Chang's type is Mr. Chow Tso-min, general manager of the King Cheng Banking Corporation which, although only four years old, has attained an enviable reputation for originality and aggressiveness. The head office of Mr. Chow's bank is in Tientsin, now in the fine former Deutsche-Asiatic Bank building. Mr. Chow is a Japanese returned student, as are the majority of the "new bankers." He began his business career with various small trading enterprises, in which he was very successful. Since 1919 he has been the vice-Chairman of the Peking chamber of commerce. Foreign representatives of the consortium have confessed their respect for his business instinct. Messrs. Chang and Chow are the leading representatives of the bankers' association and chamber of commerce, respectively, upon the commission for the tabulation and liquidation of foreign and domestic obligations created by presidential mandate of February 22nd, 1922. This commission is the concrete result of a demand on behalf of the progressive bankers for accurate, complete and convenient statistics as to the present condition of liquidation of the loans contracted though a decade of wild-cat government finance and for a definite program of amortization.

Marshal Chang Tso-lin

The overlord of Manchuria, who runs his own financial institution, The Bank of the Three Eastern Provinces, reported to hold $30,000,000 of his personal funds. He came recently to the assistance of the Bank of Communications and by reason of his strangle hold on this important institution is the most important financial figure of China.

A collaborator of these two men is Mr. Wu Ting-chang, of the Yen-yeh or Salt Commercial Bank, Mr. Wu, who is a native of far away Szechuan, is a former vice-minister of finance. He has, within the four years of its existence, made his bank a powerful influence in the banking community. The head office is housed in a modern building on Hsi Ho Yien, "Bank Street" in the old city of Peking: and eight branches have already been established.

There is associated with the "new bankers" a small but highly respected school which is even more conservative in the matter of speculative enterprise. These bankers go the limit, in refusing all dealings whatsoever with the government. They are a product of Shanghai, which has come to bear toward Peking the natural suspicion of the merchant toward the politician whom he regards as "toiling not, only spinning words." Some of their banks maintain branches in Peking—although as a rule they do not venture beyond the foreign-policed concessions—but these branches are under careful orders to avoid relations with the ministry of finance.

Although it would seem that the active program of the new bankers who are pitching in with bared arms to the task of cleaning the augean stables of government finance is more calculated to help the nation than the policy of those who studiedly avoid this plague-spot, nevertheless the attitude of the "Conservatives" is a valuable balance upon their more enthusiastic contemporaries. Their strict adherance to commercial banking as it is practised in America or England is an assurance to budding Chinese trade and industry and their imported ethics are an excellent example to financiers who lack the restraint of business traditions.

A prominent "Conservative" is Mr. K. C. Yeh (Yeh Ching-hwei) of the National Commercial Bank, Shanghai. This is the dean of "native" banks, having been formed three years before the fall of the dynasty as a financial organ of the Chekiang provincial railways. The disappearance of the Chekiang Railway Company through incorporation into the national government railway administration caused the head office of the bank to be transferred from Hangchow, the capital of that province, to Shanghai. Mr. Yeh, who had gained banking experience in the Ta Ching or Imperial Bank (upon the foundations of which arose the present Bank of China) became head of the institution. Mr. Yeh is a man of retiring although most affable manner, and constant devotion to business. He is sympathetic but always firm. Under his management the National Commercial Bank is establishing an enviable reputation for soundness. One of the striking features of China's "Money josses" is their relative youth. The oldest nation in the world has probably the youngest financial dictators. Few of the bank heads are past forty-five.

A man as aggressive, as Mr. Yeh is quiet, but who has an equal reputation for "safeness" is Mr. K. P. Chen (Chen Kwong-pu) of the Shanghai Commercial and Savings Bank, Limited. Mr. Chen is an American returned student who does not hesitate to use in his old fatherland all the resourceful methods for "putting things across" to which American business men resort. By inventive advertising he has built up what is probably the only real savings bank business among the native banks. But he refuses to allow a cent of his trust funds to go into projects bearing the governmental taint.

Of Mr. Chen's type, but falling slightly behind him in both rigour and vigor is Mr. Swen To-yu, managing director of the Chung Fu Union Bank, with head office in Tientsin. This bank is also making a start in the savings department, but has been most notably successful in exchange business, both domestic and foreign. For several reasons savings banking does not yet flourish in China. If any institution can establish confidence it has no difficulty in procuring all the money which it can capably handle from shareholders and depositors able to supply capital in large lumps. As

long as this condition prevails, and there is felt no need for mobilizing the hoardings of the small merchant and artisan, bankers will not greatly trouble to develop this more complicated form of banking. Nevertheless herein lies a tremendous, untouched field, for Chinese are all savers, and hid away about the hovels of the middle classes and poor are hoardings aggregating fabulous sums. These can be organized to an extent through skilful educative campaigns, but full confidence on the part of their possessors will only come with a stabilization of political and social conditions. It has been repeatedly demonstrated that a gambling scheme will bring out hoardings much quicker than savings-account facilities. The present collapse of aleatory exchanges is giving savings account banking a great setback.

There is another set of Chinese financiers who operate in co-operation with foreign capital, under the recent Chinese laws governing the incorporation of sino-foreign joint-stock firms. The pioneer sino-foreign banks were the Sino-Japanese Exchange Bank of China, capitalized at ten million yen ; and the Chinese-American Bank of Commerce, financed on the American side by the Stone-Wiggin interests, and which has a paid-up capital of U.S. $10,000,000. The leading figures in Sino-Japanese finance are Mr. Lu Tsung-yu, an ex-official ; Mr. Li Shih-wei, an ex-minister of finance who never assumed office ; and Tsao Ju-lin, mentioned above. The outstanding advocate of financial co-operation with American capital is Mr. Hsu En-yuan, a returned student of political as well as business acumen. With him is associated in a more or less honorary capacity. The Honorable Chien Neng-hsun, a former premier.

The phenominal success of these institutions is responsible for a fever of sino-foreign promotion, and two Sino-Italian, one Sino-Scandinavian, and one Sino-British Bank are among the institutions launched within recent months, while numerous others are projected. Commercial and manufacturing companies of all kinds are being formed along the same line. Sino-foreign banks do not as yet, however, constitute a greatly influencing factor in the Chinese financial world. The Chinese-American bank has set a helpful precedent by co-operating with the Native Bankers' Association.

The banking institutions of all the foregoing groups are ambitious to be nation-wide in scope. Their plan is to establish branches first in the busiest treaty-ports and gradually reach out toward the interior, although with the exception of the semi-government Banks of China and Communications, they have not yet gotten beyond the port cities. There are developing in the individual provinces, however, merchant financiers who are working within provincial boundaries for the assemblage and organization of the capital of their particular provinces, the financing of provincial and county governments, construction of public works, and encouragement of local industries, and commerce in local products.

C. K. Yeh
Chairman, National Commercial Bank

The most flourishing development of this sort has taken place in the economically and politically independent province of Szechuan, and the self-assertive province of Shantung. The most highly-respected provincial bank is that founded by the great Szechuan firm of Young Brothers seven years ago. The bank now has branches in the treaty ports and Peking and correspondents abroad, but it exists primarily for the purpose of facilitating Szechuan's trade. Shantung has several growing local banking institutions the most reputable of which is the Shantung Bank, whose credit is better in the province than that of the national government banks.

Chief among the militarists who have turned financiers, is Marshal Chang Tso-lin, high inspecting-general of Manchuria. His Three Eastern Provinces Bank is capitalized at eight million dollars, and is under his direct managment. From this institution, which is reported to hold thirty million dollars to the personal account of the satrap, Chang was able to provide four million dollars in silver to save the Bank of Communications from the threatened collapse caused by the run at the last year end

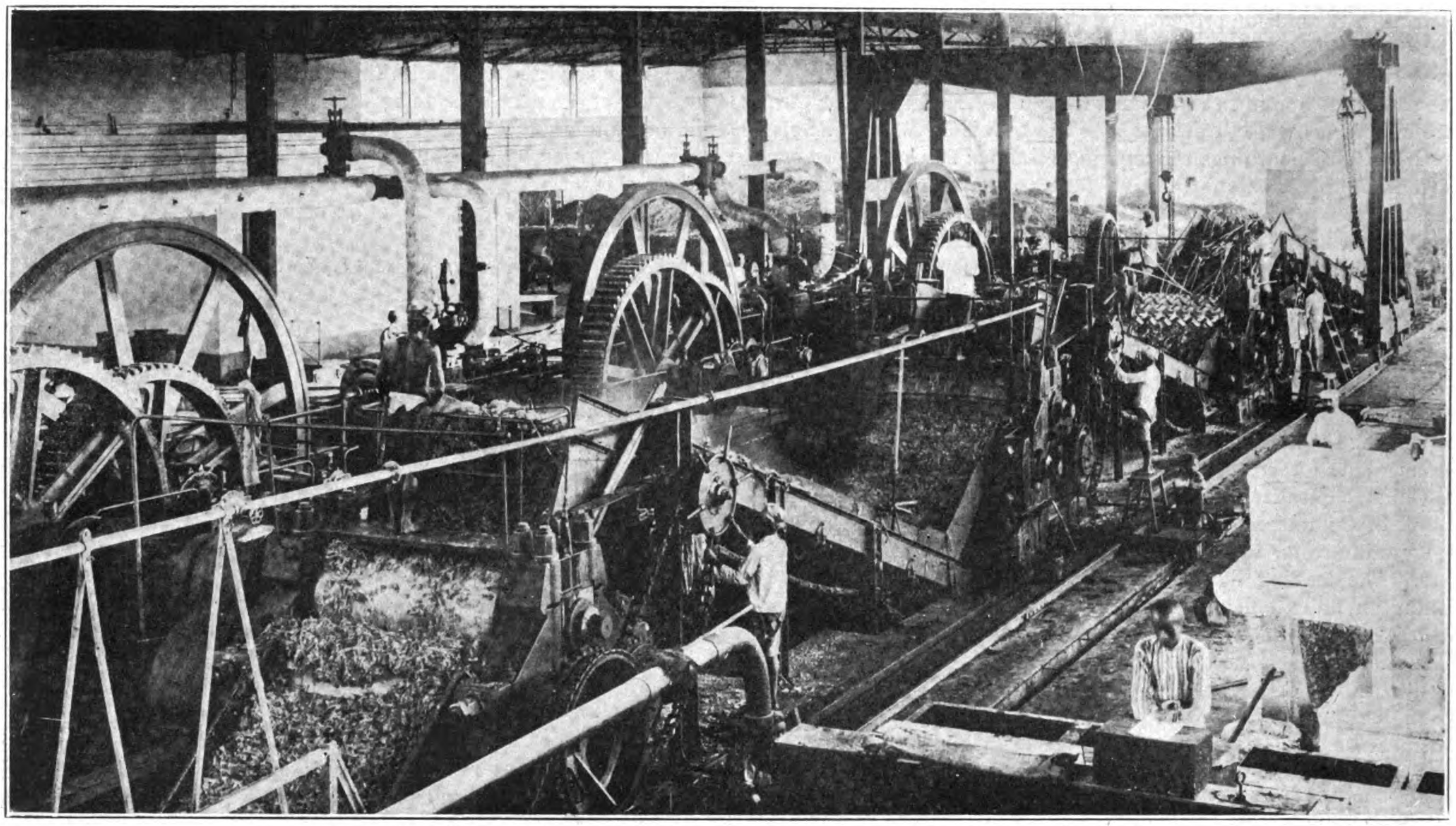
Other militarists whose fortunes give them a place in China's pantheon of wealth are the ex-premier, Chin Yun-peng ; the monarchist Chang Hsun ; the high inspecting commissioner of Chihli, Shantung and Honan, Marshal Tsao Kun ; and the ex-*tuchun* of Hupeh, Wang Chan-yuan—a typical Chinese provincial verres.

There remains one further class of capitalists of whom we may speak in much higher terms. These are the successful pioneer capitalists of the new industrial era which is dawning in China. They are men who have made fortunes by breaking away from the traditional merchantile methods to venture into quantity manufacturing with western machinery. Cotton spinning has thus far proved the most profitable form of manufacture attempted in China. In the Shanghai district a score of men have thereby accumulated sufficient wealth to become factors in the money market. The most picturesque character among them is Chang Chien, a man of determined ideas and ideals—a gentleman of the old school who seeks his country's salvation in the development of her material resources and her industrialization.

Chang Chien and his devoted collaboraters have transformed a piece of swamp land in their native county, one hundred miles up the Yangtze River from Shanghai, into the model manufacturing city of Nantungchow ; he has, through his continued efforts, at last brought the attention of the Peking government to the serious problem of conservancy and port improvement on the Whangpoo and lower Yangtze ; and he is now the key to the barrier which stands in the way of the Seims-Carey grand canal project. But his story is a romance in itself, which we cannot relate here. His chief interest to the subject in hand is the fact that he is founder and principal shareholder of the Hwei Hai Industrial Bank, operating in Shanghai and the cities of the lower Yangtze ; and an important director in the National Commercial Bank described among the "Conservatives" above.

Manufacturing has not progressed so far in China's northern ports as in the Shanghai region : nevertheless the north has produced some pioneer captains of industry. Chief among these is Chow Hsueh-hsi, managing director of the National Industrial Bank of China. Mr. Chow, like Mr. Chang Chien, is a Chinese of the old type, who combines with his circumspect scholarliness a shrewd and aggressive business sense. He received his foreign education in Japan. In the third year of the republic he was minister of finance, and while holding this position projected the Peking waterworks. His enterprises include the largest cotton spinning mills in Tientsin and Tsingtao. He holds a large interest in the British-controlled Kailan Mining Administration, which has a practical monopoly of the coal industry in North China. He is also principal owner of the affiliated Chee Hsin Cement Company, a director of the Bank of China and shareholder in several other banks.

China's newly developing capitalist class is composed of diverse elements. Its smallness compels a good deal of shoulder-rubbings, and a spirit of co-operation for purposes of protection and progress is growing. The sounder and more constructive elements are gradually coming to the fore. This development is earnest that China's government by military adventurers is to give way to government by industrial and financial captains—a decided advance, politically as well as economically.



A typical Java Milling Plant, showing Independent Crusher and two Three Roller Mills

The Java Sugar Industry

By K. R. F. Blokzeijl

THE island of Java is the largest producer of cane sugar in the Far East, it being favored with an especially suitable climate for the cultivation of sugar cane.

The commanding position which the industry at present holds among the producing countries of the world has been secured by an admirable organization for mutual assistance in all directions, above all in regard to research, and by the adoption of methods of cultivation and manufacture on which it would be difficult to improve, carried out under highly-trained and well-paid supervision. The most valuable assistance rendered by the experimental stations which are supported by the planting community, is one of the principal reasons for the progress of the Java sugar industry in the course of time. The agricultural section of these experimental stations consists of one main station and five substations at various districts of the island at which investigations in respect to soils, fertilizers, diseases of canes and varietal tests are made. Besides, there are technical and chemical sections. Every fortnight a report is received from each factory and the figures are carefully controlled, referred to the same basis and put in tabular form for comparison.

The laboratories of the chemical section are fitted with most up-to-date apparatus. There is also a splendid reference library for research work and a museum representing samples of sugar, molasses, cane, etc.

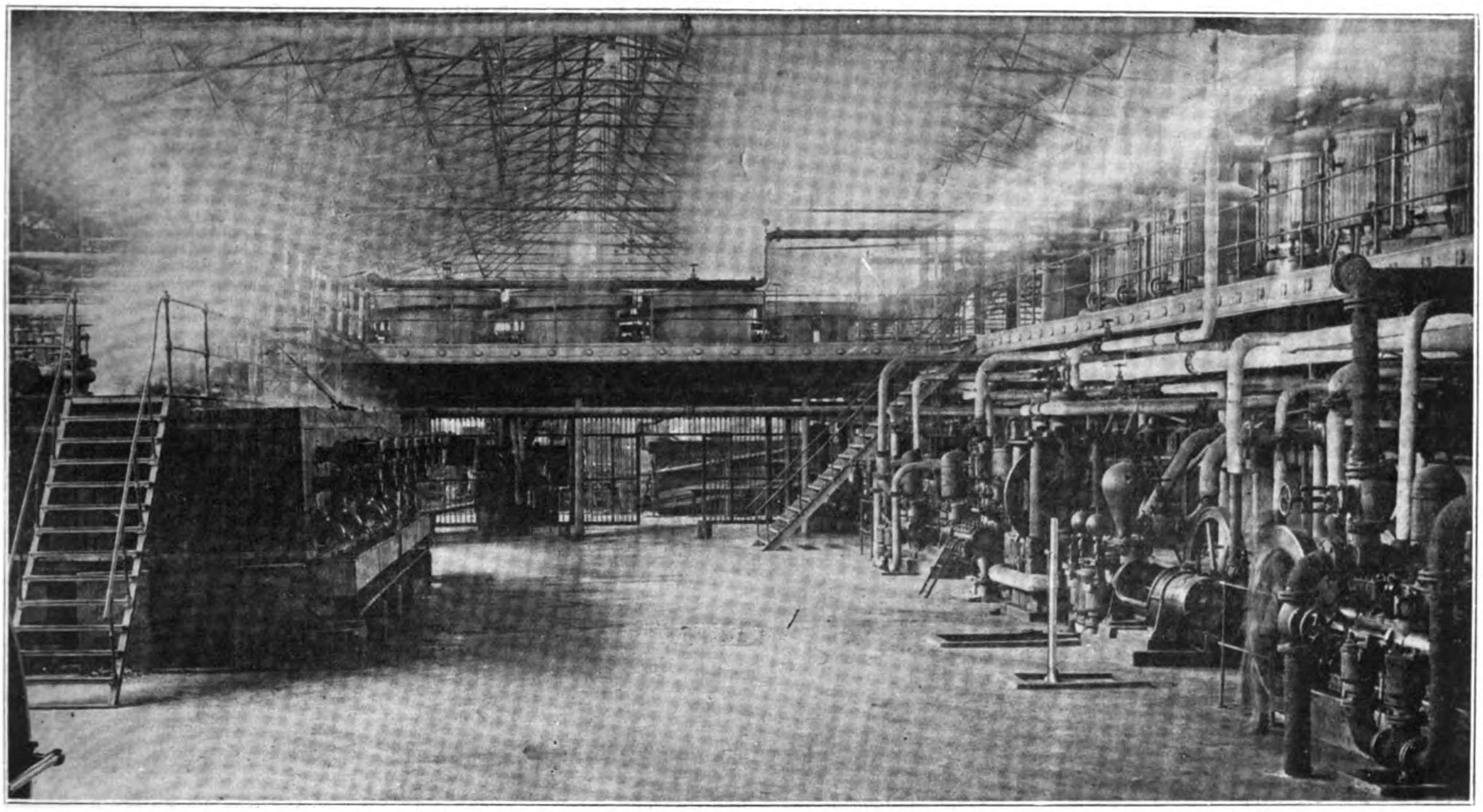
The technical section carries out experiments in the various factories on evaporation, boilers and furnaces, steam economy, etc., in order to try to improve the factories where necessary. All apparatus, such as steam and vacuum gauges, thermometers, meters, etc., are tested and calibrated before being delivered to the factories. It is, for instance, through these investigations that the department has designed a form of furnace which permits the factories to burn additional fuel besides bagasse. Various other improvements have been made by this department, resulting in considerable economy of manufacture.

The sugar factories in Java are found, as a rule, in the densely populated districts in the low-lands, and in most cases it is not difficult to obtain the requisite labor. But during rice harvests, during the construction of great public works, or during an epidemic, labor is occasionally difficult to get. Such cases, however, are not frequent when compared to other sugar-producing countries.

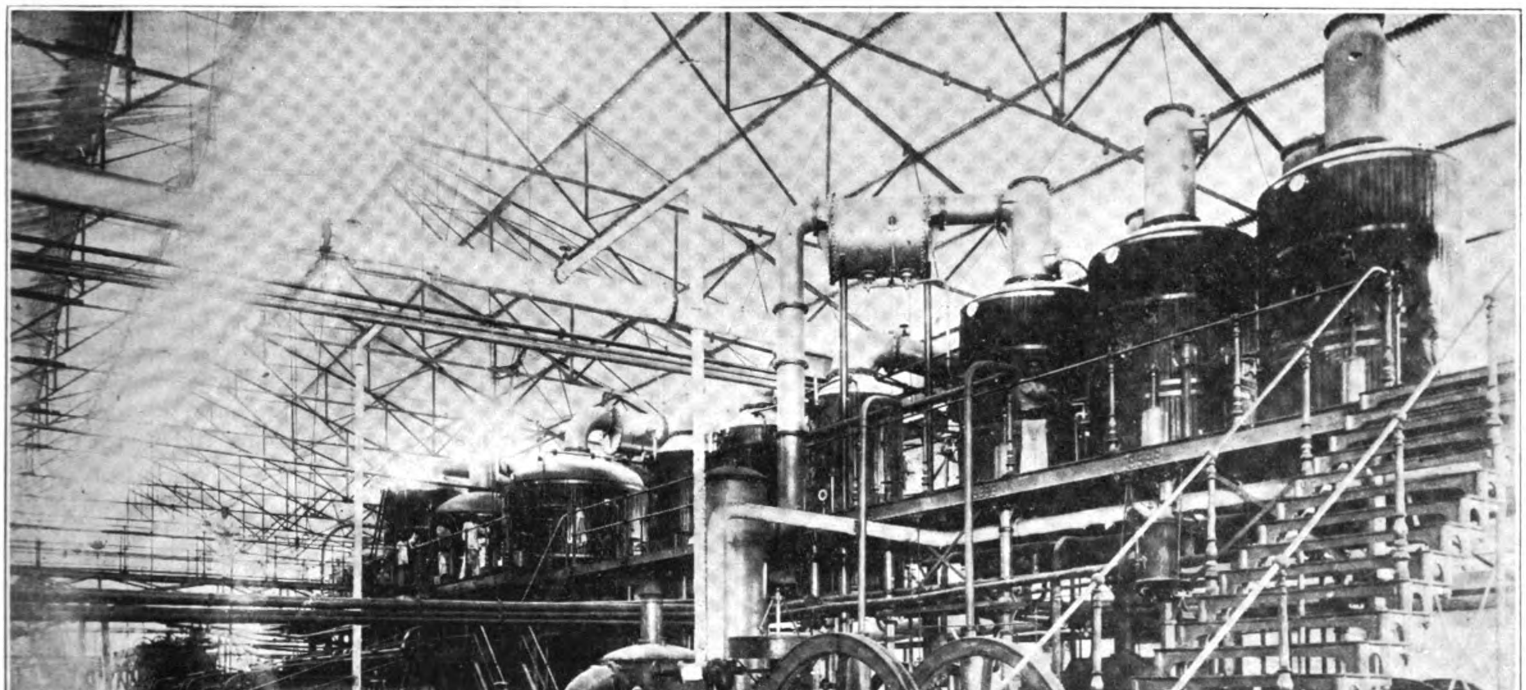
Only free labor is used. The heavy work is done exclusively by men, the light work, such as cutting tops, planting, watering and weeding are in many districts carried out by women. Children are also employed, viz., to destroy insects and to do similar work. The chief condition for a successful cultivation of sugar cane is an abundant rainfall during its growth and a period of interrupted drought during harvest time. Where Java is concerned, the farther one proceeds eastward, the more one may rely on a perfectly dry east-monsoon. Therefore, most of the sugar estates in Java are confined exclusively to the eastern and central parts of the island, that is to say, to the districts east of the line formed by the river Tjimanuk.

The cane requires a period of more than 12 months to ripen; other crops are planted on the same lands in sequence, cane being grown once every three years. The rotation of crops is roughly as follows:

1st year	May till October	Harvest of sugar cane.
	October till November	Soya beans, maize, etc.
	November till April	Rice.
2nd year	April till November	Indigo, tobacco, beans, etc., follow.
	November till April	Rice.
3rd year	April till May/October of the 4th year sugar cane.	



A typical Boiling House of a Java Sugar Mill, showing quadruple effect, Vacuum Pans and Circulating Pumps to the right and Clarifiers in centre.



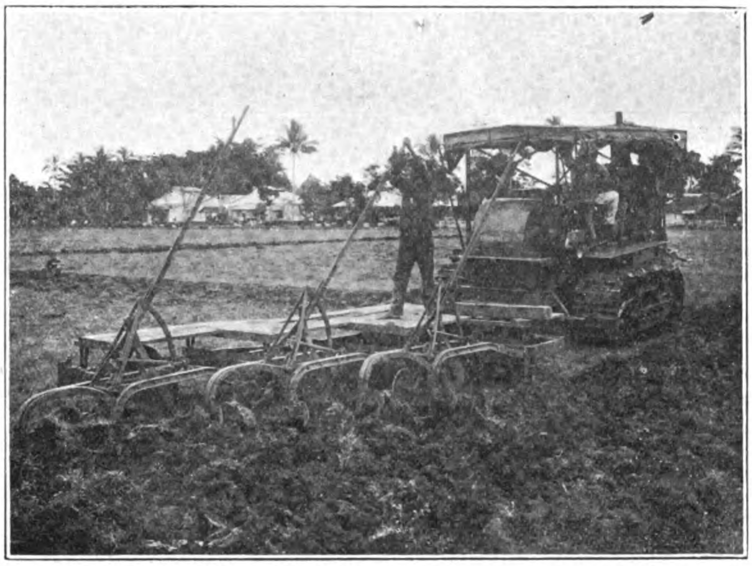
Another Boiling House Installation, showing two sets of Triple Effects, three Vacuum Pans and Vacuum Pumps, the Pans discharging into a Crystallizer Battery. Behind the latter is seen the Centrifugals.

Planting Cane in Java: loosening the soil in the rows, all done by hand

A Young Cane Field

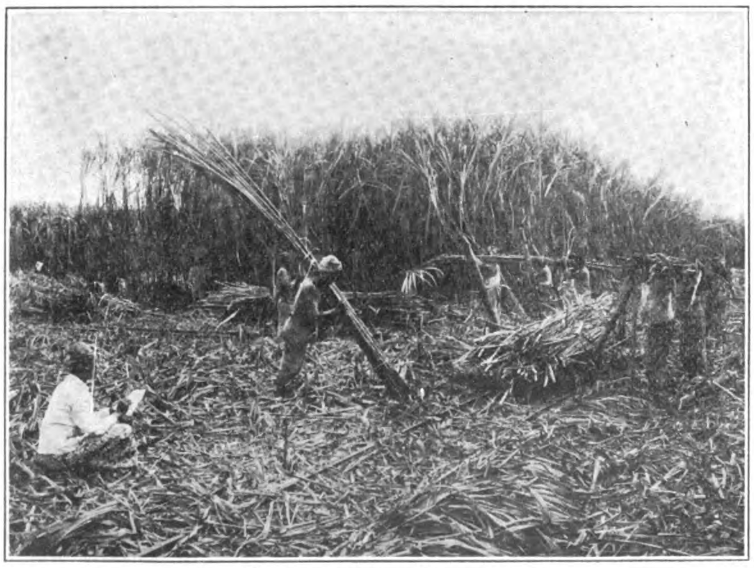
Of the crops being grown between two of sugar cane, the latter alone is cultivated by the European planter, while the other are planted by the native population on their own account and without interference on the part of the sugar manufacturer.

The excellence of the methods of cultivation in use on cane lands in Java has long been recognized. The trench system known as the "Reynoso system" is in general use on all factory lands. Cultivation is still carried out almost entirely by hand labor and little progress has been made up to the present in the adoption of mechanical methods. The first step taken is to construct drains. These are of two kinds, deep drains 2-ft. wide and 1½ to 2-ft. deep, and shallow drains 1-ft. to 1½-ft. deep. The shallow drains run into the deeper ones. Where the land has exceptionally good natural drainage, the deeper drains are dispensed with. On such lands the shallow drains are made 30-ft. apart, but when used in conjunction with deeper drains on land with poor natural drainage they are sometimes closer and may even be only 12 to 15-ft. apart. The larger drains are 120-ft. apart. This procedure results in a highly efficient system of drainage, and without it it would not be possible to grow cane on much of land in Java.

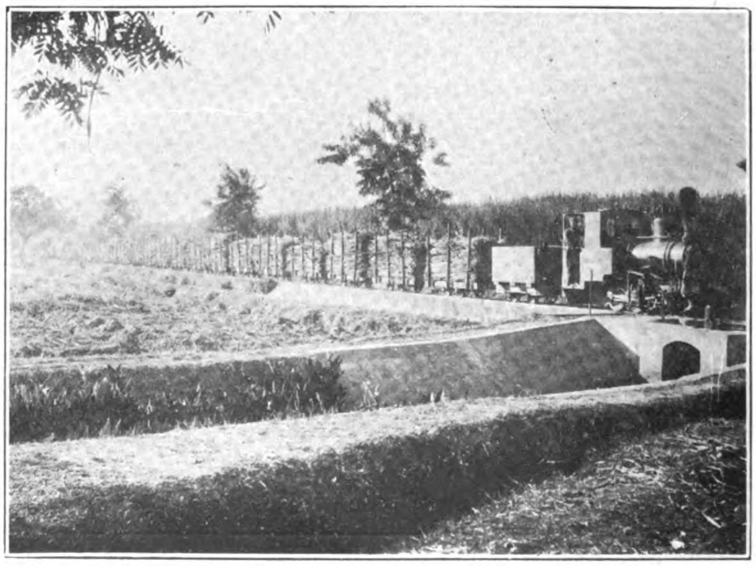


An American Caterpillar Tractor hauling a gang plow in Java

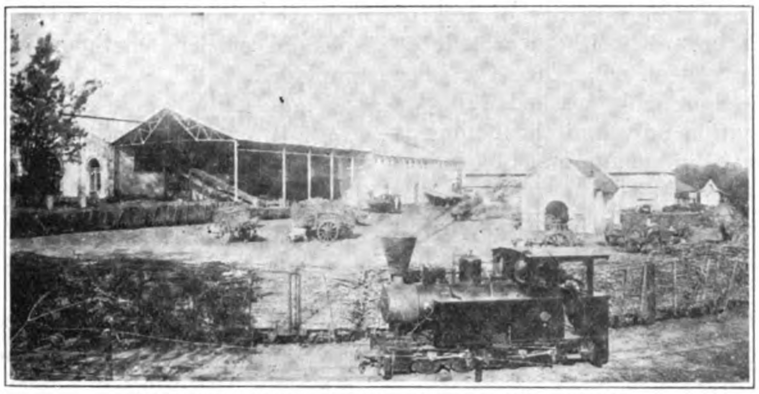
A prominent feature of the cane cultivation is the rapidity with which land is prepared for cane planting. Immediately after the construction of the drains is completed, the making of the trenches is begun. These are made between the smaller drains and are thus 12 to 30-ft. long. The standard dimensions are 4-ft. from centre to centre, 1-ft. deep and a little less than 2-ft. wide. After the trenches are made, the soil at the bottom is dug to a depth of six inches. The trenches are made gradually as the rice crop is removed and no preliminary ploughings are given.



Cane Cutting and Loading on Trucks



Transport of Cane to Mill



The Batey of one of the Smaller Java Sugar Mills

The sets are sown some six to eight weeks after the trenches are made and, as a rule, parallel to the sides of the trenches and only a few inches apart. The sets with young shoots are planted in a sloping position. Other sets are planted at a very shallow depth in the trenches and are often not completely covered with soil. As soon as the canes are planted, they are irrigated, the drainage channels being used as irrigation channels. The water requirements of the cane crop have been carefully worked out and cane is consequently grown with the minimum of water necessary. Weeding and shallow cultivation are done as required and, as the young canes grow, the trenches are gradually filled in. The canes are always thoroughly earthed up. This is done in three operations from October to December for canes which are planted in June.

The usual form of manure is sulphate of ammonia. In some soils which are deficient in phosphorus superphosphate is necessary, but its use is not extensive. Potash salts are not used; this chemical is present in the soil in sufficient quantities.

While the canes are still young, such pests as borer beetles, larvae of beetles and termites have to be caught, but as soon as the last banking is over and the rainy season has made the roads impracticable, all labor ceases. When the dry monsoon has once more returned, the trash is removed from the stalks and soon afterwards harvesting commences.

In the laboratory of the factory the cane is continually being tested, in order to ascertain how far it has matured. Then, when the roads have become dry, the ripest plantations are chosen for cutting. "Cutting" is merely a word, because the cane is dug out as far as the old sets and uprooted as completely as possible, the greatest care being taken to leave as little of the cane as possible in the soil. The adhering earth and roots are then removed and the tops with the green leaves are cut off.

The cane comes into the factory on trucks containing from 6 to 8 tons. These are run alongside the carrier and the contents are hoisted bodily from the trucks by means of an electric crane and deposited on a sloping platform, from which they are fed to the carrier by a rake which is worked mechanically.

The efficiency which, as will be evident from the preceding descriptions, has been brought to bear on the agricultural side of the industry is equally apparent in the factories. The machinery is of the most modern kind and the roominess and cleanliness of the factories conduce to high efficiency.

There are in all 186 sugar factories in Java. Of these the number which submit returns to the research station association varies from 138 to 145, but only 77 to 100 include information regarding engineering work. It is on these returns that the information which follows is based.

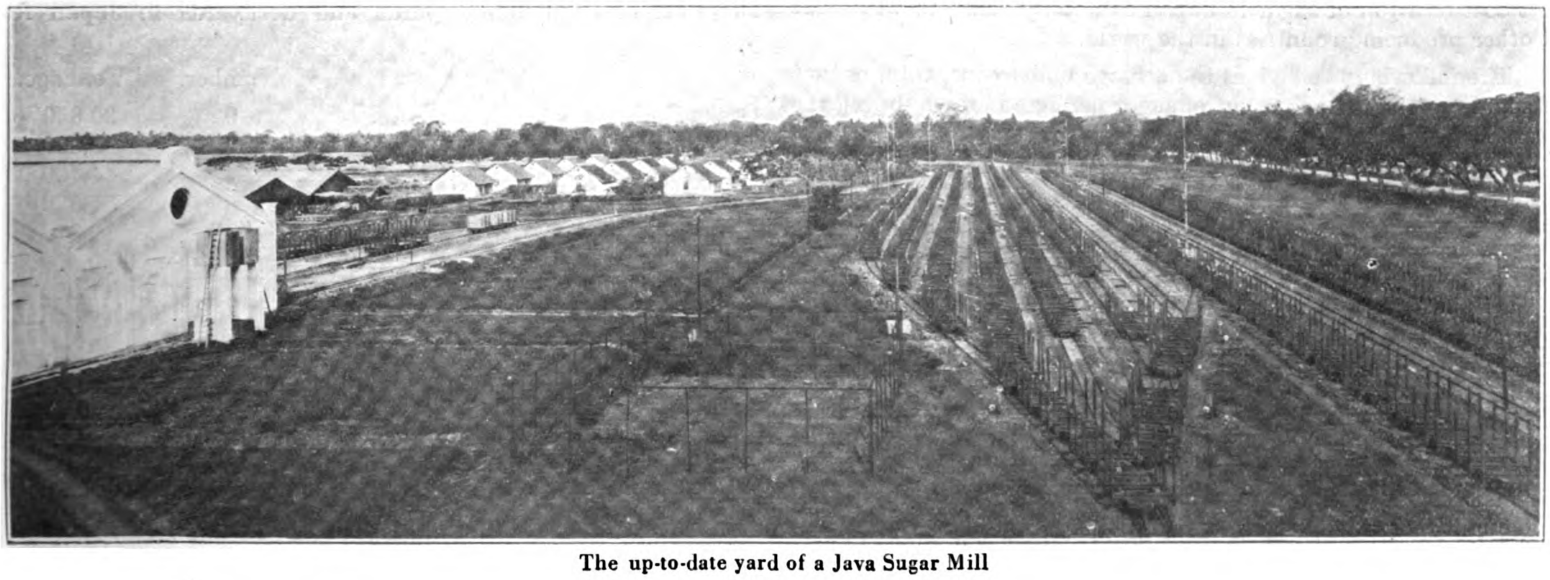
Few of the factories have mills (i.e., steam-driven rollers, between which the cane is caught and pressed) which consist of less than 9 rollers with crushers, or 11 rollers in all, and many have 14 rollers. The figures for the 77 factories referred to above are as follows:

Factories with a crusher and four mills or fourteen rollers in all	8
,, ,, four mills only or twelve rollers in all	11
,, ,, a crusher and three mills or eleven rollers in all	24
,, ,, three mills only or nine rollers in all	33
,, ,, a crusher and two mills or eight rollers in all ..	1

The cane, as a rule, has to pass through three sets of rollers which are placed one behind the other and is drawn from one to the other by means of automatic carriers. The rollers of the second set are placed closer together than those of the first, and those of the third closer than those of the second. By these means nearly all the juice is extracted from the cane. While passing from one set of rollers to the next the bagasse is sprinkled with water in order to dilute the juice still left in it. The diluted liquid is extracted in the next crushing. The residue, which after having passed through the three mills still contains half its own weight in diluted juice, is carried by means of a movable platform to the furnaces and is there used as fuel for the boilers of the steam engines which supply the power for working the factory.

The juice obtained by the process of pressing is freed from all foreign matter by means of strainers and is then mixed with milk of lime and boiled. By this process the liquid is divided into a clear light colored juice and a dark colored one into which the impurities have been participated during the treatment. The clear juice is drawn off, while the sediment is filtered in so-called filter-presses. These apparatus extract a certain amount of clear juice which is added to the first product. The remaining refuse is removed from the factory.

Instead of this simple process a more complicated method is frequently used. According to this, the juice after having been



The up-to-date yard of a Java Sugar Mill

pressed from the cane is mixed with a large quantity of milk of lime and treated at a low temperature with either carbonic or sulphuric acid till the lime is again neutralized. Then the juice is filtered and the cakes of residue thoroughly washed. In this way clear juice is obtained by filtration only and the boiling is obviated. The juice is then evaporated in vacuum pans by means of steam.

The syrup thus obtained is, after having been filtered, boiled in a vacuum in order that the sugar may crystallize. After this has been done the crystals are freed from the adhering molasses by means of centrifugals. These so-called first molasses are again boiled and the remaining sugar is extracted. The remaining exhausted molasses are removed.

A great deal of thought and rouble has been spent in order to link these various processes together and to make them into a harmonious whole. But even now a great deal of care has to be exercised in making preparations for the "campagne," i.e., the milling season, for a hitch or an interruption means a serious loss.

For many years previous to this, a small quantity of white sugar had been manufactured in Java for home consumption, but the production of this article for the purpose of exportation started only in 1903, in which year a shipment of 1,000 tons was sold to British India. The attack on the British Indian market proved a great success, the sugar found ready buyers and very soon Java began to manufacture white sugar in big quantities. This, of course, caused a great revolution in the working of the factories. After experimenting for a short time, they succeeded in producing a faultless white product without incurring greater expense than that which is entailed by the manufacture of muscovado. Java sugar, therefore, became more and more popular in British India and when, in 1911, the German sugar crop failed on account of great drought, white sugar was also shipped to England. The importation of white sugar from Hongkong into British India has almost entirely stopped and it is now only Java and Mauritius which supply the requirements of the great Indian empire so far as its own production is unable to meet the demand. Besides British India, also Japan, Hongkong, Australia, Singapore and several European countries buy Java sugar. The first named buys chiefly white sugar, the others raw sugar and by-products.

The great increase in the production of sugar per unit of area and the improvement of the quality of the article have, of course, not been brought about without the investing of a very large capital. The more intensive cultivation of land, the method of seed supply, the disinfecting, the manuring, the means of transport and locomotion, the machinery for the manufacture itself, the careful surveying and the constant chemical control and scientific investigations have increased the expenses per acre considerably, whereas the wages of the native laborers have, especially during recent years, materially risen. Notwithstanding this, the average first cost of a ton of sugar in Japan can easily compete with that of other producing countries in the world.

The following table gives the acreage under cane, total output of sugar, as well as the output of sugar per acre in Java during the years 1900 to 1920:—

Year.	Acres under cane.	Sugar production in tons	Pounds of sugar per acre.
1900	224,300	732,500	7,380
1905	260,500	1,022,800	8,779
1910	312,600	1,254,600	9,034
1913	360,400	1,436,600	9,006
1916	388,900	1,597,200	9,208
1919	340,100	1,309,400	8,626
1920	385,700	1,513,000	8,834

A fact which is not apparent in studying these figures, but which is still of great importance when judging results, is that the quality of Java sugar has materially improved during the last fifteen years or so, and is at present of much greater commercial value than formerly when the new and expensive, but splendid efficient methods of manufacture were not yet being employed.

The above story of the Java sugar industry would be incomplete without some reference to the fact that this industry proves a real blessing to the island. It gives work to hundreds of thousands of laborers, enables railways and trams to run at a profit, calls to life numerous smaller industries, such as lime kilns, brick works, machinery shops, manufacturies of household articles, and in short spreads a vigorous life over the entire country. One of the great boons is undoubtedly the encouragement given to railways and tramways. For, not only do they connect the centres of supply with those of demand, but the natives are also given a chance of visiting other parts of the country and, by drawing comparisons, learn a great real. The result has been that instead of being content to live in primitive dwellings and to have few wants, we now meet with many natives who have higher aspirations and, what is even better, the means of satisfying them.

For the European, whether he has been born in Java or whether he has immigrated, the sugar industry reaps many a benefit. The 183 factories which were working in 1920 employed over 3,000 Europeans, most of whom are married men with families. They enjoy good salaries, besides, in many cases, receiving in addition yearly gratuities. On account of the fact that successful men retire early and on account of constant vacancies occurring through men going on home-leave, promotion is rapid and there are few professions in which a young man, without money or influence, can so soon reach a lucrative position and in which he may with capacity, zeal and common sense reach the highest ranks without being obliged to invest even the smallest sum. Above all, however, it is necessary to acquire a good education as an agriculturist, an engineer, a chemist or a mechanician.

The figures below show the total exports of Java sugars during recent years:—

	Quantity in metric tons			
	1915	1918	1919	1920
Superior white sugar	1,142,490	1,504,480	1,841,713	1,483,223
Raw sugar	62,546	33,975	19,969	21,643
Molasses	165,696	34,110	132,697	178,153

Japan's shipbuilding industry during 1921 was much more depressed than in 1920. As against 93 ships, of 433,000 tons, built in 1920, only 42 ships, of 217,000 tons, were constructed last year, which is a decrease of 51 in number and 216,000 tons. The following figures show the number and tonnage of ships launched at principal shipbuilding yards and dockyards in Japan last year:—

	Number.	Tonnage.
Osaka Steel Works	9	30,850
Mitsubishi Dockyard	6	43,390
Kawasaki Dockyard	7	44,460
Yokohama Dockyard Co.	5	31,820
Asano Dockyard	3	19,350
Kobe Steel Works	2	10,400
Mitsui Dockyard	2	11,000
Uraga Dockyard	1	2,200
Toba Shipbuilding Yard	1	3,000
Nitta Shipbuilding Yard	1	3,800
Fujinagata Shipbuilding Yard	1	3,750
Uchida Shipbuilding Yard..	1	5,700
Ishikawajima Shipbuilding Yard	1	5,600
Ono Steel Works	1	1,300
Total	42	217,220

River Conservancy in China

By Lawrence Impey, Assoc. M. Inst. Mun. & County Engrs.

Chief Engineer, Sze Tze Kow Conservancy Scheme

IN the year 2297 B.C. occurs the first flood of which the history of China takes note, when the Yellow River or Huang Ho, sometimes known as "China's Sorrow," overflowed its banks with most disastrous results.

The dual rulers of the middle kingdom, Yao and Shun, called into counsel the famous Yu, as being the only person competent to deal with the disaster, and it is recorded that after eight years of unremitting labors, during which he never left his duties for so long a period as to enable him to visit his home and parents, Yu was successful, and the waters were drained off into specially constructed rivers and canals.

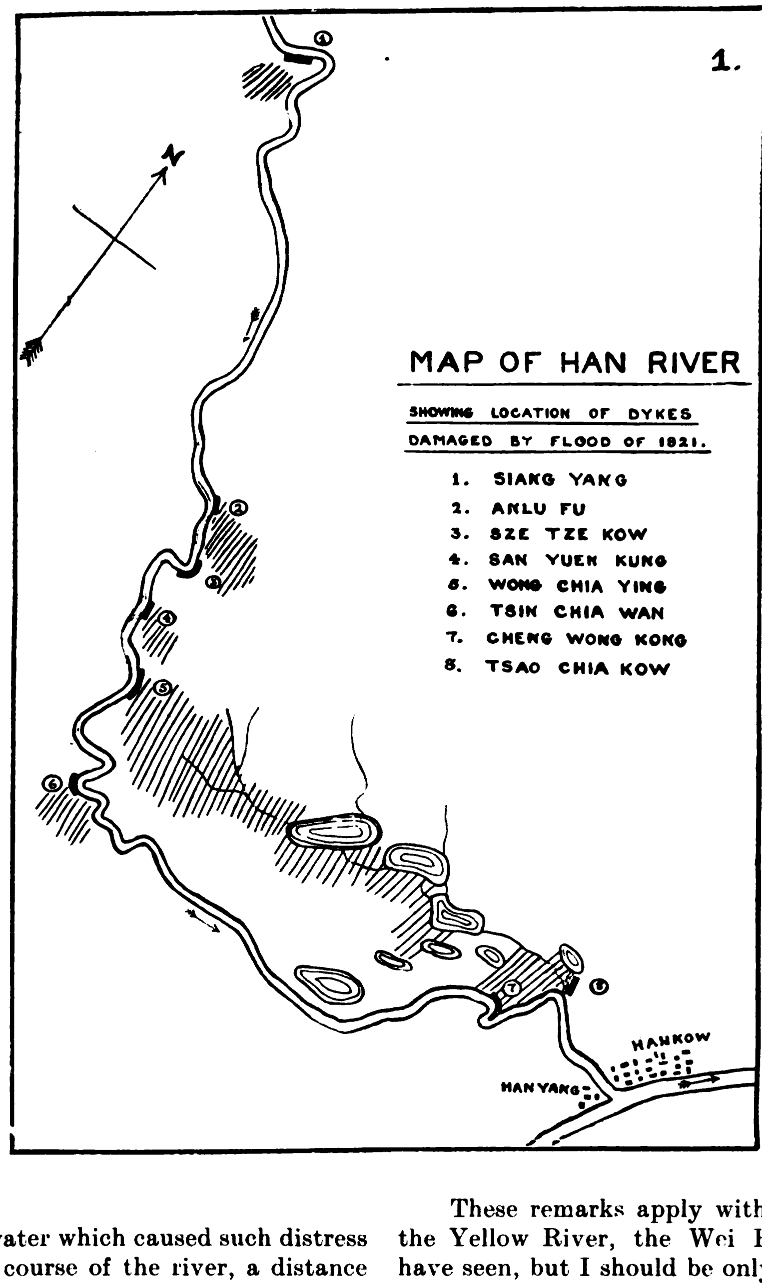
This, I believe, is the first record of conservancy work which history can show, and is certainly one of the finest in its achievements.

From that day to this the history of China has been marred by the record of a succession of floods on the part of the Yellow River, the Yangtze, or the Wei Ho, or the Han River, and it is this question to which I would ask you to give a moment's thought.

For purposes of illustration I propose to deal with the course of the River Han, which flooded the country on both sides of its channel during the autumn of 1921, and with which we are now endeavoring to cope.

The first point to be noticed is the unusual length of the rivers of China, and the consequent volume of water accumulated from their watersheds.

The flooded territory, shown on the accompanying map as shaded area, does not appear so extensive, until it is realized that the distance from the first point at Siang Yang, to the junction of the Han and the Yangtze at Hankow, is a matter of three hundred miles.



Furthermore, the volume of water which caused such distress was accumulated over the whole course of the river, a distance of over two thousand miles, the greater portion of which has been explored by but two or three foreigners at the most, and concerning which no statistics are available.

It should be realized also that owing to the small scale of the map on Sheet 1 it has not been possible to indicate the numerous bends in the course of the river, which has in reality a far more tortuous channel, the boats going up stream pointing their prows first west, then north, then east, and probably west again, which renders navigation by the use of sails a matter of extreme difficulty.

As you can see, by referring to the section on Sheet 2, the water level of the river varies over twenty feet during the rainy season, and the pressure exerted by the increased volume of water is enormous.

Owing to the angles in the channel it often happens that two or three miles of flood water makes a direct assault on some particular portion of the dyke, with what results it is easy to imagine.

In the first place, although the dyke is faced with stone in some places, it has no foundation, with often a very sharp angle of entry to the river, and therefore, even in the less dangerous portions, the damage caused by erosion is very great.

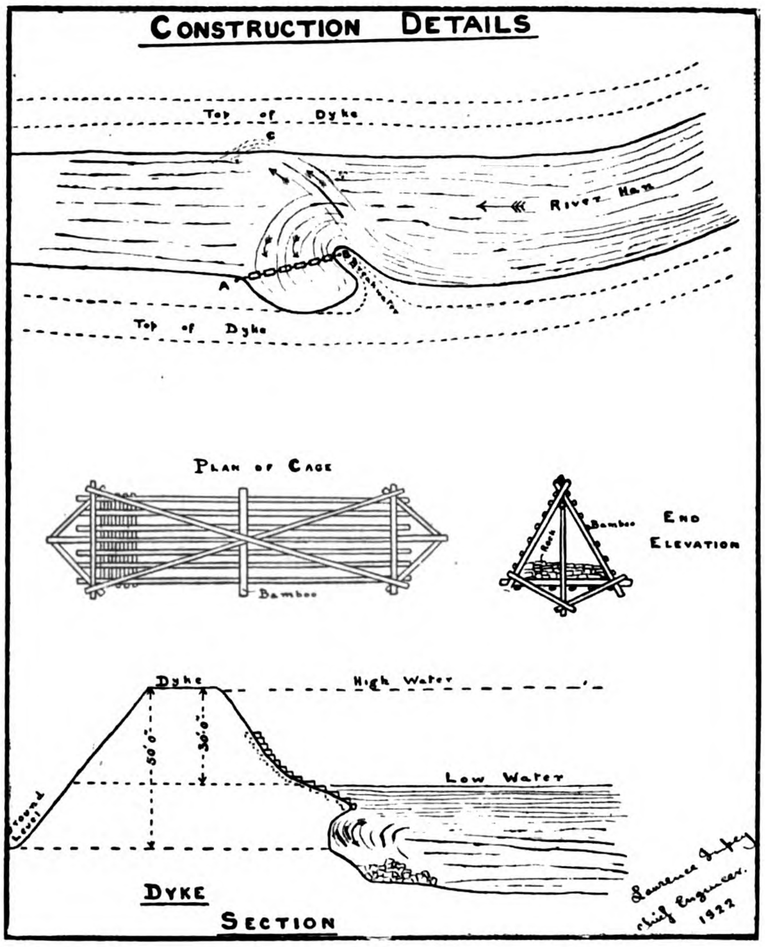
The Chinese of the past few generations have developed a system of so-called 'breakwaters' as shown in the plan on Sheet 2, with the effect which is shown by the arrows on the sketch.

The angle to the current varies from forty-five degrees to a right angle, and the water attacks the opposite shore, washing away large areas of land, and also, forming a curious eddy, destroys the dyke immediately behind the breakwater, as illustrated in the plan, which is drawn from my survey of an actual site.

I am unable to discover why the Chinese are so attached to this form of construction, but from observation of the breaks in various parts of the river, I am unable to see anything to recommend it as an engineering theory.

These remarks apply with equal force to those portions of the Yellow River, the Wei River, and the Yangtze, which I have seen, but I should be only too pleased if any of my readers with greater experience would supplement my suggestions and comments.

The methods which we are adopting will not commend themselves to experts, doubtless, who will cry out at the lack of foundations for construction, and the smallness of the piles, and the absence of cement facing, but I can only say in excuse



that the time and funds at our disposal would not permit of this form of construction.

The piles used are 9-in. in diameter, and from twenty-two to thirty feet in length, placed at two feet centres for spacing, and having a penetration of from fifteen to twenty-two feet.

Stout bamboos are woven between them, as indicated in the diagram on Sheet 3, and behind this retaining wall is placed the broken rock, to a thickness of three feet, and a depth of eight feet.

The piles are tied back by quarter inch wiring, made fast to a base pile some twenty feet in the rear, which is ultimately buried in the earth by the depth of the re-made embankment.

With regard to the bays caused by the breakwaters, which the Chinese at present will not allow to be removed, I am trying a cheap experiment which may overcome the danger, and which I have sketched roughly on Sheet 2.

Bamboo cages are being constructed as shown in the diagram, some twenty feet in length, and with a base width of five feet, the construction being such that ultimately it has a mesh of about an inch.

The theory is that of the permeable breakwaters of Germany and Holland, which permit of the passage of water bearing alluvial deposit, but which slow the current down to such an extent that it is forced to relinquish its burden of soil, with the result that the breakwater gradually silts up.

This method of passing a chain of cages from Station A to Station B is an experiment, as there is very little data available as to the results of such a theory in other countries, if, however, it prevents scouring, it will more than repay its cost.

With regard to the methods of construction work I can only say that they are extremely primitive, which statement I will support with a few illustrations.

The piles are pushed into the muddy bottom of the river by the united efforts of some half-dozen coolies, and when this result has been achieved they then erect a sort of frame on the pile itself, which they slip up to within three feet of the top, and which by some species of miracle remains there, and what is more, supports the gang, who proceed to balance on this precarious platform and with the aid of a circular stone, weighing fifty pounds or so, they pound the said pile into the ground, sinking gradually with it themselves.

Earthwork is paid by the *fong*, or one hundred cubic feet, and the natives bring the dirt to the site in carrying baskets, wheel-barrows, bullock carts, and various other means of conveyance.

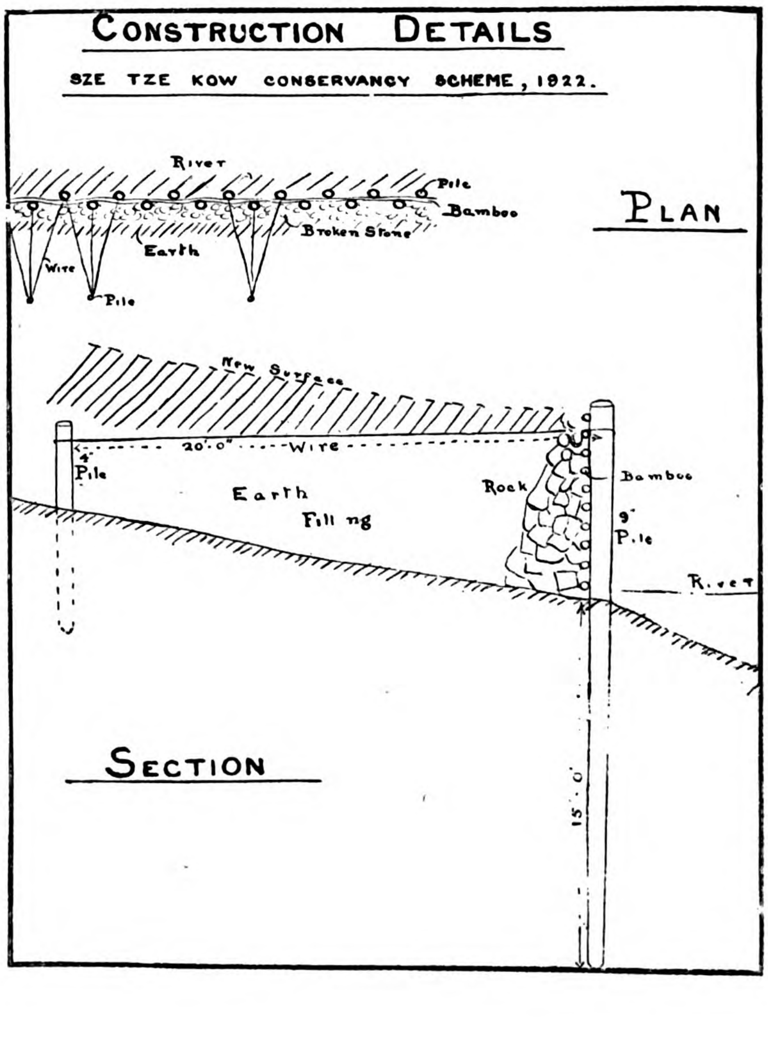
The foreman gives each worker a bamboo slip for the load deposited, and when ten such slips have been accumulated they can be exchanged for another representing that amount of work, until at the end of the day all slips are redeemed in cash.

The cost of driving a pile may be said to average half a dollar each, and the price per *fong* of tamped earth is a little above or below one dollar, according to the distance of haulage.

I estimate that the laborers on our work can earn from three hundred and fifty to four hundred and fifty cash a day, which enables them to live on until the harvest is due, for it must be remembered that most of the labor is famine labor due to the flood, and that in ordinary seasons prices will naturally be higher.

I append hereunder the figures of expenditure on the Han River work this year, allocating each to its particular source :—

International Famine Relief Committee. Grant.	International Famine Relief Committee. Loan.	Local Subscription.	Government Grant.	Location of Work.
$	$	$	$	
	10,000	10,000		Siang Yang.
20,000		40,000		Anul Fu.
50,000			50,000	Sze Tze Kow.
		10,000	20,000	San Yuen Kung.
			1,200,000	Wong Chia Ying.
60,000		40,000		Tsin Chia Wan.
10,000	10,000	20,000		Cheng Wong Kong.
	10,000	10,000		Tsao Chia Kow.
$140,000	$30,000	$130,000	$1,270,000	



With regard to the work at the government section at Wong Chia Ying, after examination of the site, in company with two or three competent engineers, Chinese and otherwise, we came to the conclusion that the work was extremely slipshod, unsound in theory, and so high in cost compared with results as to be out of all proportion.

On further investigation I found that there was no qualified engineer on the work, that there were some twenty different departments, none of whom were collaborating, and some of whom did not seem to be responsible to even one central authority.

The authority was vested in a very estimable odl man, who was very seldom on the spot, as far as I could tell, the recommending factors in his favor were old age, good disposition and vegetarianism; probably he came from the home town of some one in authority.

At all events there was a wonderful system of overseers and foremen, all of them taking a little 'squeeze,' and then delegating the job to others, so that it was almost impossible to discover who was really responsible for any particular piece of work.

The work being undertaken at Tsao Chia Kow varies from the rest, in that it consists of the construction of a canal, to drain some of the flooded areas back into the river, a work which might be very largely extended if funds and time permitted.

In spite of all the repair work which has been and will continue to be done, the river gains ground, and shifts its channel, as do all the other rivers of China, leaving in their wake a desert of sand on which nothing can be grown, and aptly pointing the moral of the title of the Huang Ho, ' China's Sorrow.'

The only real solution of the difficulty lies in the straightening of the channel, and the constant use of dredgers, though it is possible that the narrowing of the limits and direct and rapid course of the river would also achieve the result of scouring the channel, and obviate much of the repair work which is at present necessary.

It is an interesting comment on the importance of river navigation and conservancy work in China, to note that the first conservancy engineer in Chinese history became one of the first emperors of the middle kingdom, one of the famous rulers of the golden age, and the saying attributed to Yu, in which he gives the secret of his success, might well be inscribed in letters of gold, for our modern scientific knowledge can add but little to it:—

" Keep the channel straight and its bottom clear."

Silk Mills in Hangchow

HANGCHOW, the provincial capital of Chekiang, is a famous silk-producing centre with several mills operating along modern lines. The most important of these are:

WAI CHENG.—The Wai Cheng Silk Weaving Factory, Ltd., established in 1912, and registered in the same year with the ministry of agriculture and commerce, under the management of Mr. Chu Kwang-shou. The main factory is situated at Shaw-chi-tang-hong, Hangchow, with a branch which is under construction at Dah-yen-chong-jao, Kashing. The former is divided into six departments, viz.: hand-weaving, design, adjusting, twisting, reeling and dyeing, employing about 1,700 workmen; the latter, when completed, will have four departments, viz.: power-weaving, twisting, adjusting and reeling. The yearly output is valued at over $1,200,-000.

HOO LING.—The Hoo Ling Silk Textile Plant, Ltd., founded in 1912, is located at Poo-chang-hong, Hangchow. The factory has three departments, viz.: weaving, design and adjusting. It employs about 1,300 workmen turning out an annual production of about $700,000 in value. A branch plant, consisting of reeling and twisting departments, has been recently erected. Mr. Tsai Ching-yen, graduate of the Dyeing and Weaving College at Tokyo, is general manager.

YUEN TSENG WOO.—The Yuen Tseng Woo Silk Weaving Factory at Hsiao-foo-ching-hong, Hangchow, was founded many years ago. The factory consists of the winding, twisting, reeling, design and is equipped with 200 looms and employs more than 1,600 employees. It is capable of turning out a yearly production valued at $600,000. Mr. Yuen Chiar-tseng is proprieter and manager.

TIEN CHONG.—The Tien Chong Silk Weaving Factory at Pu-chiar-lung, Hangchow, was registered with the ministry of agriculture and commerce in December, 1920. It consists of six different departments, viz.: reeling, winding, weaving, twisting, figuring and power rooms and has 600 employees at work. The production of the factory amounts to about $350,000 in value every year. Mr. Chow Ching-yuen is general manager.

CHING CHENG.—The Ching Cheng Silk Weaving Factory at King-dong-jao, Hangchow, was registered with the ministry of agriculture and commerce in March, 1913. The factory is divided into four departments, viz.: weaving, figuring, winding and dyeing and employs 410 workmen. Its general manager is Mr. Hsu Yih-ching, and its annual output is 4,000 pieces of satin valued at $240,000.

YU CHONG WEN.—The Yu Chong Wen Silk Weaving Factory in the eastern section of the city was founded and registered at the end of late Ching dynasty, in 1912, 170 modern looms were installed. At present there are 400 employees and its yearly output amounts to $300,000 in value. Mr. Chiu Yih-yung is general manager.

KIU CHEN.—The Kiu Chen Silk Weaving Factory at Wu-foo-liu, Hangchow, was registered with the ministry of agriculture and commerce in 1914, under the management of Mr. Wang Hsiao-ching. It has 130 looms in operation and 370 workmen, producing 4,600 pieces of silk fabrics per year valued at $240,000.

TSENG FOONG.—The Tseng Foong Silk Weaving Factory at Ching-lung-chiar, Hangchow, was registered at the ministry of agriculture and commerce in 1914. There are 120 looms and 330 employees. It produces silk fabrics to a value of about $240,000 every year. Mr. Chen Mow-ching is general manager.

LUNG CHONG.—The Lung Chong Silk Weaving Factory at Hwang-tsoo-yuen-hong, Hangchow, was established in 1917, and is managed by Mr. Kao Pang-nien. It is equipped with forty-two modern looms and employs 180 workmen, with an annual output of about $120,000 in value.

SUI SING.—The Sui Sing Silk Weaving Factory, located at Teng-yuan-jao, Hangchow, was organized in July, 1915. The factory has two departments and employs 180 workmen with an annual output of about $130,000 in value. Mr. Shen Yao-foo is its general manager.

DAH SING.—The Dah Sing Silk Weaving Factory at Chang-ching-chiar, Hangchow, founded in 1915, is run under the direction of Mr. Chen Tze-an. It has about 100 looms in operation, and keeps 180 workmen at work. Its yearly output is approximately $120,000 in value.

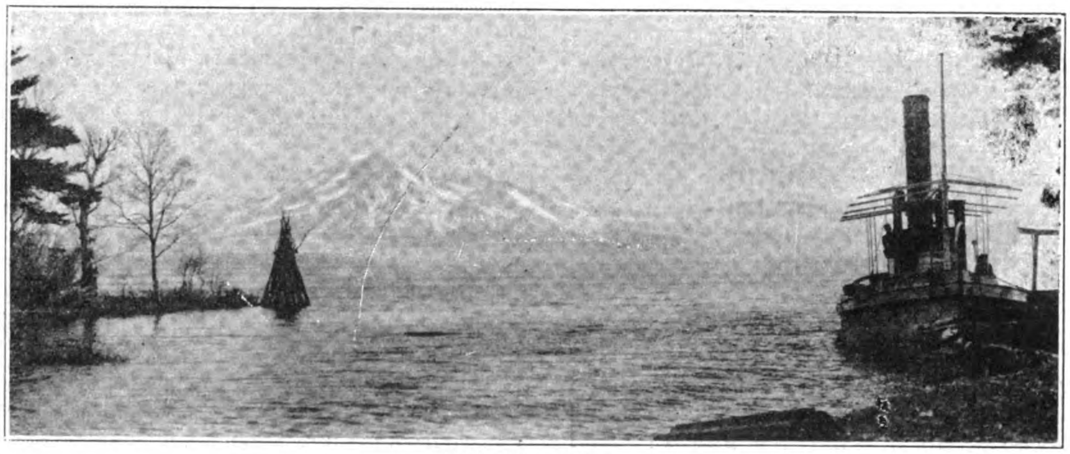
The Japanese Soap Industry

The value of the soap produced in Japan in 1908 amounted to Y.3,040,000. In 1918, ten years later, it attained Y.20,940,000, of which Y.10,490,000 were for toilet soaps. In 1918 Japan had 277 soap factories, employing 2,988 hands. In 1919 there were exported Y.3,000,000 worth of toilet soap and Y.500,000 worth of household soaps, while Y.3,600,000 soap were imported from abroad, chiefly from England and the United States. The requirements of caustic soda and carbonate of soda are covered by the leading Japanese soda-producing districts. English and American sodas are not so dear, however, so that Japanese manufacturers are not clamouring for customs discrimination to be made against them. In 1920 a new soap and candle factory was founded, under the style and title of the "Japan Soap Manufacturing Co."; it will work chiefly for exportation, similar to the already existing "Nippon Glycerine Manufacturing Co."

Japan's "Water Powers"

The Inawashiro Hydro-Electric Power Company, Ltd.

As far back as 1896, the North-Eastern Electric Power Company and the Japan Hydro-Electric Power Company had been promoted for the purpose of utilizing the flow of the Nippashi River for the generation of electric power, their plans, however, being confined to obtaining water rights on the river itself, overlooking the more important source of power confined within Lake Inawashiro. In 1910, their rights were taken over by the promotors of the Inawashiro Hydro-Electric Power Company, Ltd., after which negotiations were entered into for acquiring the rights of the Asaka Irrigating Association, who obtained in 1878 the privilege of utilizing the waters of Lake Inawashiro for irrigating large tracts of rice lands in Asaka perfecture. With control of the lake as a storage reservoir, the new enterprise was placed on a secure basis, making possible the transmission of power to Tokyo, 140 miles away. In July, 1911, permission was granted by the ministry of communications to proceed with the plans. The first meeting of the shareholders of the new company was held on October 30 of the same year, in which the nominal capital was authorized at Y. 21,000,000, divided into 420,000 shares of Y 50 each. The company then secured the reservoir rights to Lakes Hibara, Onogawa and Akimoto which lie at a higher altitude than Lake Inawashiro, and then obtained rights to the Nagase River which serves as the outlet to the above lakes and empties into Lake Inawashiro.

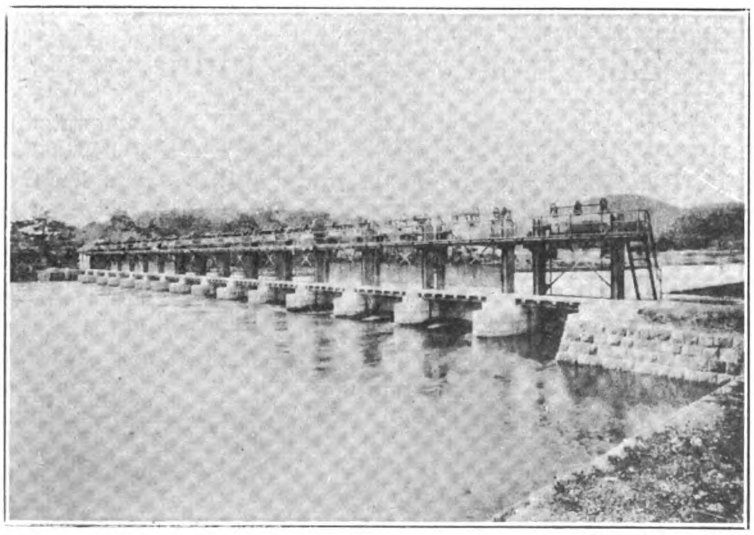


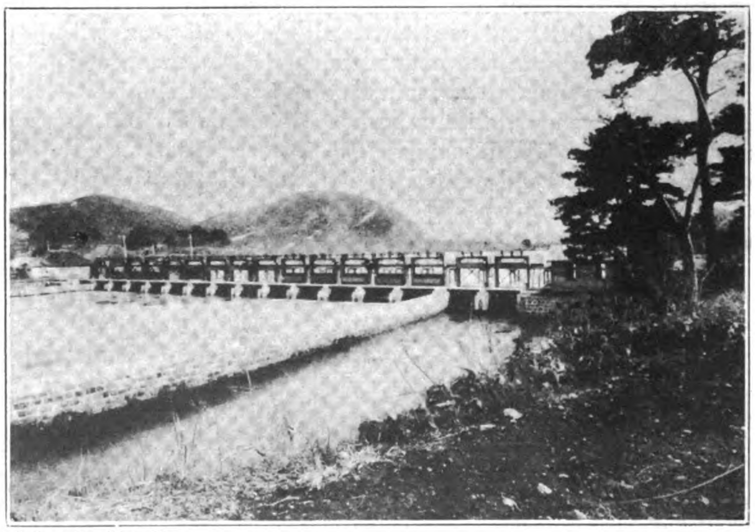
Lake Inawashiro

General Plan

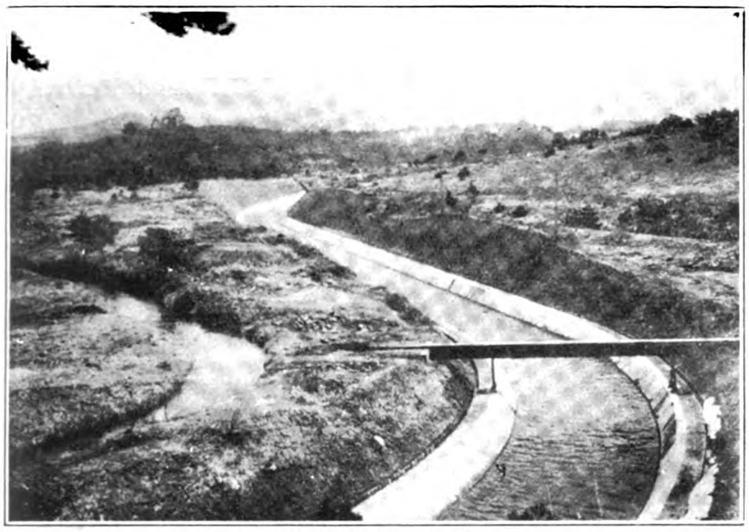
Lake Inawashiro, with nearly 42 square miles of water surface, drains an area of 319 square miles (including the Nagase River and other streams which empty into the lake). It has a depth of 3.2-ft. and a storage capacity of 3,500 million cubic feet. Its elevation is 1,700 feet above sea-level, or 1,000-ft. higher than the plateau of Wakamatsu. The Nippashi River flowing northeast is the only outlet to the lake and its drainage area. In the Wakamatsu plateau it joins the Ara River and empties into the Japan Sea. Four power houses are installed along the Nippashi River. According to the franchise granted by the government the quantity of water flowing normally in the Nippashi River is placed at 1,000 cubic feet per second, but by regulating the flow at the "Juroku-kyo" gates, a maximum flow of 1,600 cubic feet per second can be obtained, corresponding to a peak load of 62.5 per cent. load factor. Several irrigating canals located between power houses three and four decreases somewhat the quantity of water available for these plants.

Above Lake Inawashiro, are located three lakes, Hibara, Onogawa and Akimoto, connected by the Nagase River, and emptying into the larger lake. Lake Hibara with an elevation of 2,700-ft., has an area of about 4.1 square miles, draining a watershed of about 40 square miles. Its depth is about 43-ft. and its storage capacity about 4,200 million cubic feet. Lake Onogawa, is 2,620-ft. above sea-level, 0.6 square miles in area, draining about 55 square miles of territory, including that of Lake Hibara. Its depth is 29-ft. and its storage capacity,330 million cubic feet. There is a difference of 230-ft. in elevation between this lake and the next lake, Akimoto. Utilizing these two lakes as reservoirs, the Onogawa power house is to be installed. It is calculated that the maximum and mean yearly flow of water through this power house will be at least 485 and 315 cubic feet per second, respectively, the load factor being assumed as 65 per cent.



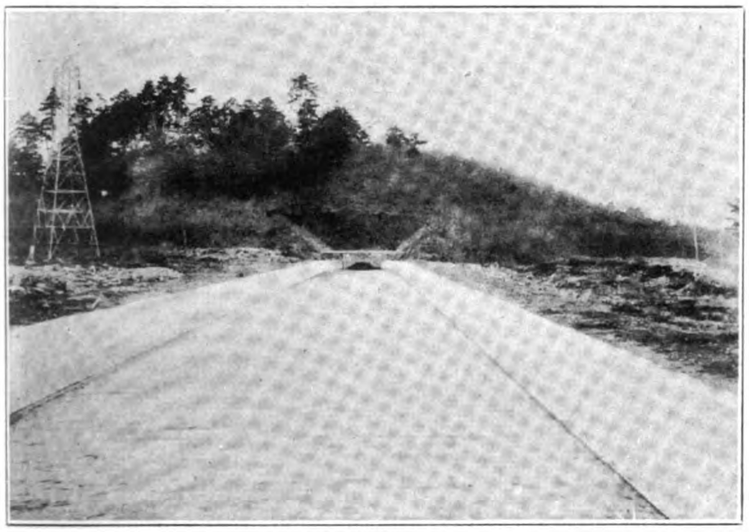


Regulating Gates of "Joruku-Kyo"

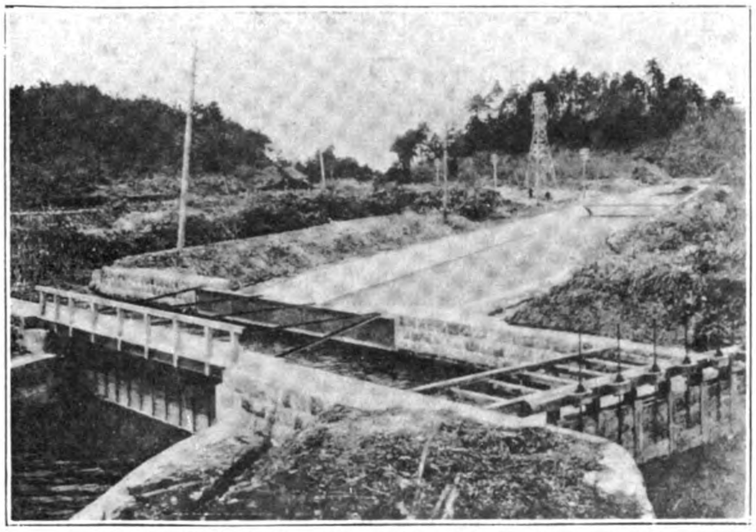


No. 1 Open Canal

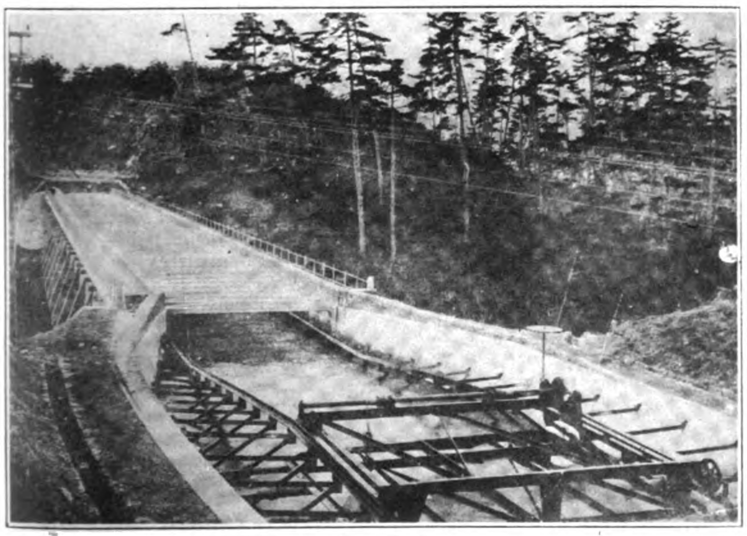
No. 1 Conduit



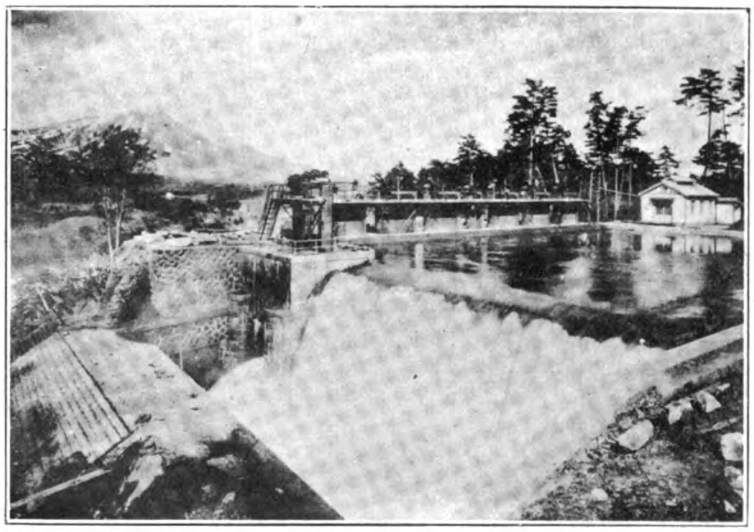
No. 1 Tunnel



Tonokuchi Irrigation Flume Crossing the Power Canal



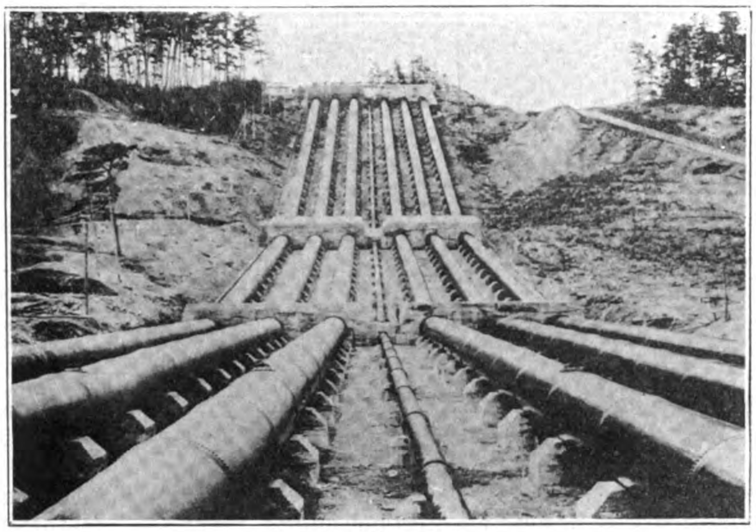
Aqueduct



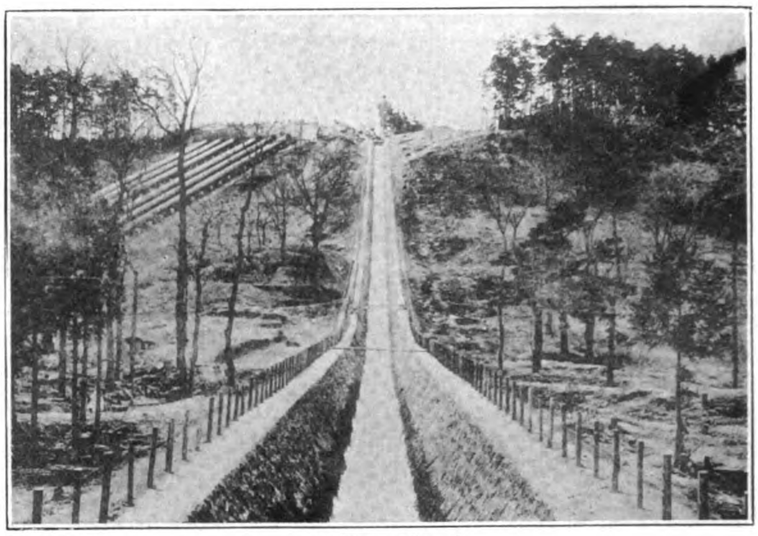
Head Tank

Lake Akimoto has an elevation of 2,390-ft. above sea-level, with a fall of 690-ft. to Lake Inawashiro. Its area is 1.2 square miles, draining a water-shed of about 42 square miles. Its depth is 39-ft. with a storage capacity of 1,100 million cubic feet. Between the two lakes are to be installed two power houses, the Kawakami power house for the upper section and the Myoka power house for the lower. By utilizing the three lakes as seasonal and daily regulating reservoirs, the maximum and mean flows through the Kawakami power house throughout the year are calculated to be 897 and 583 cubic feet per second respectively, the load factor being assumed at 65 per cent. A descrease in the water for the Myoka power house is necessary because of the existence of some irrigating canals above its site.

The following table shows mean effective head, maximum quantity of water and corresponding theoretical horse-power for the respective power houses.



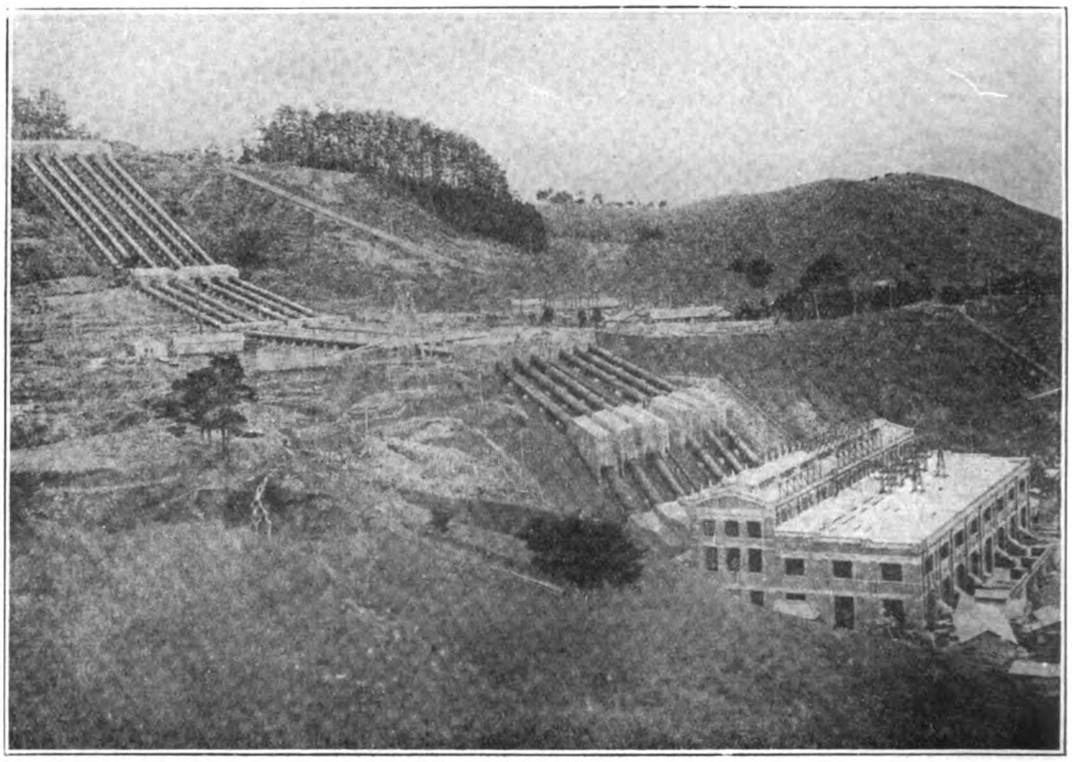
Pressure Pipe Lines



Spillway Canal

Power House		Mean Effective Head	Maximum Water Quantity	Theoretical H.P.
No. 1	..	352.4 ft.	1,600 c.f.s.	64,000
No. 2	..	228.2 ,,	1,600 ,,	41,400
No. 3	..	133 ,,	1,478 ,,	22,300
No. 4	..	211 ,,	1,450 ,,	34,700
Onogawa		202 ,,	485 ,,	11,100
Kawakami		274 ,,	897 ,,	27,900
Myoka	..	288 ,,	869 ,,	28,400
			Total ..	229,800

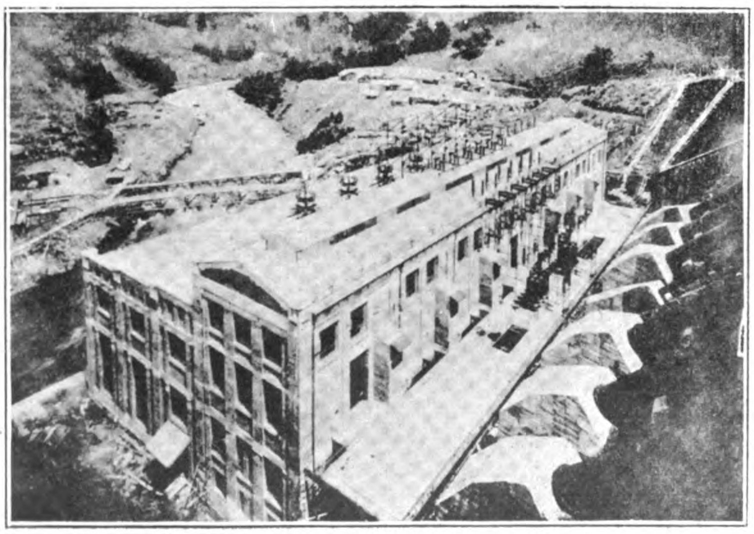
The output of the above seven power stations is to be centralized at No. 1 power house near Lake Inawashiro. The transmission lines run southward, passing through a mountainous region until they arrive at the town of Shirakawa. Thence they follow the government railway, traversing flat country, touching at the cities of Utsunomiya and Koga, and terminating at the Tabata receiving station near the city of Tokyo.



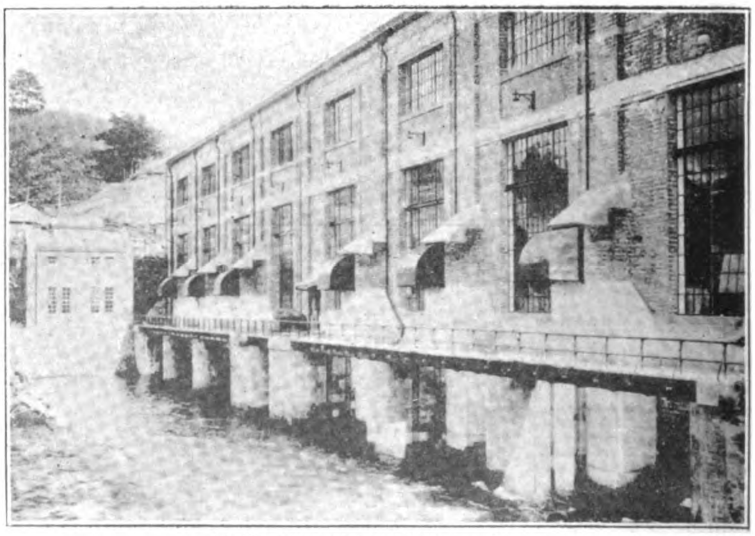
No. 1 Power House

Power Canals

Taking advantage of the topographical conditions of the district, the aggregate effective head of about 900-ft. along the Nippashi River is to be divided into four sections, with a power house for each section. Along the Nagase River, there will be installed three power houses and one canal without power house. The design of each canal will be found on next page.



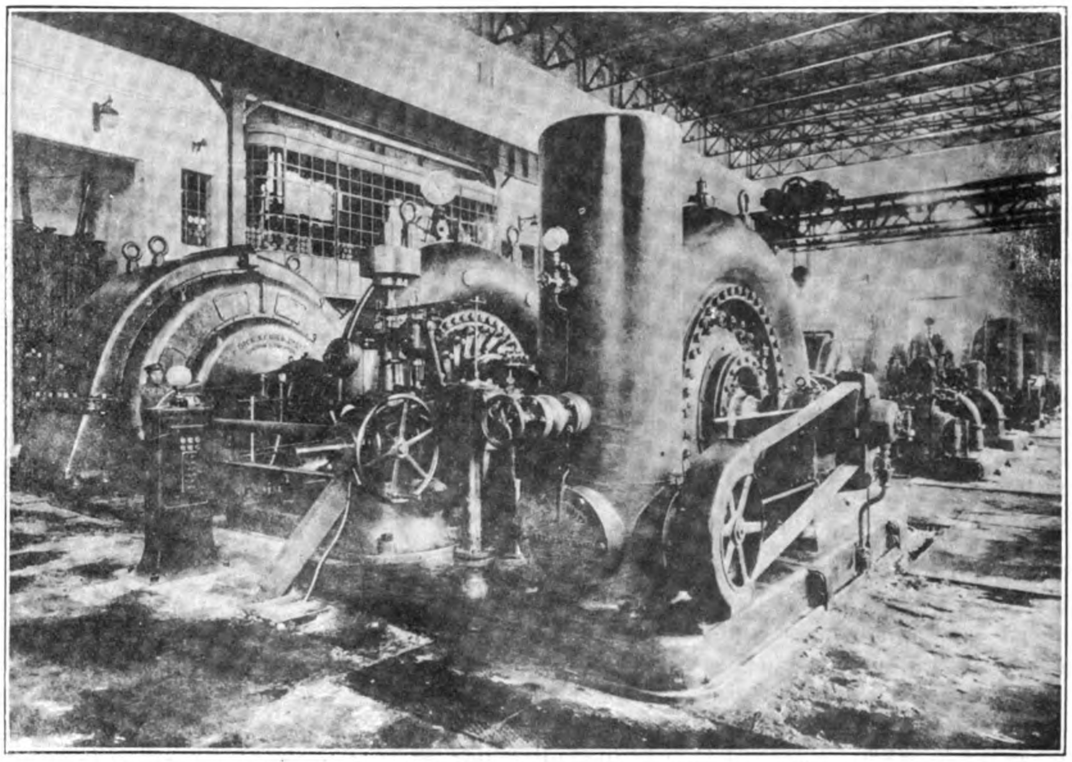
Roof Installation of No. 1 Power House



Tail Race of No. 1 Power House

NO. 1 POWER CANAL.—The intake is placed at about 5,580-ft. down stream from "Juroku-kyo," which is located at the mouth of Lake Inawashiro. The length of the canal is about 7,920-ft., consisting of two tunnels, four open canals, five conduits, and two aqueducts. There are six (one spare) main pressure pipe lines, inner diameter being about 7-ft., and one exciter pipe line, under an effective head of 352.4-ft. The water from the tail-race of the power-house discharges directly into the Nippashi River. The grades of the canal varies from 1-ft. in 1,500 to 1-ft. in 2,000-ft.

NO. 2 POWER CANAL.—The intake is placed near by the tail-race of No. 1 power house; total length, 3,990-ft., consisting of one tunnel and one open canal. There are five (one spare) main pipe lines, inner diameter about 7-ft., under an effective head of 228.2-ft. The water from the tail-race of the power house discharges directly into the Nippashi River. The grade of the canal is 1-ft. per 1,500-ft.



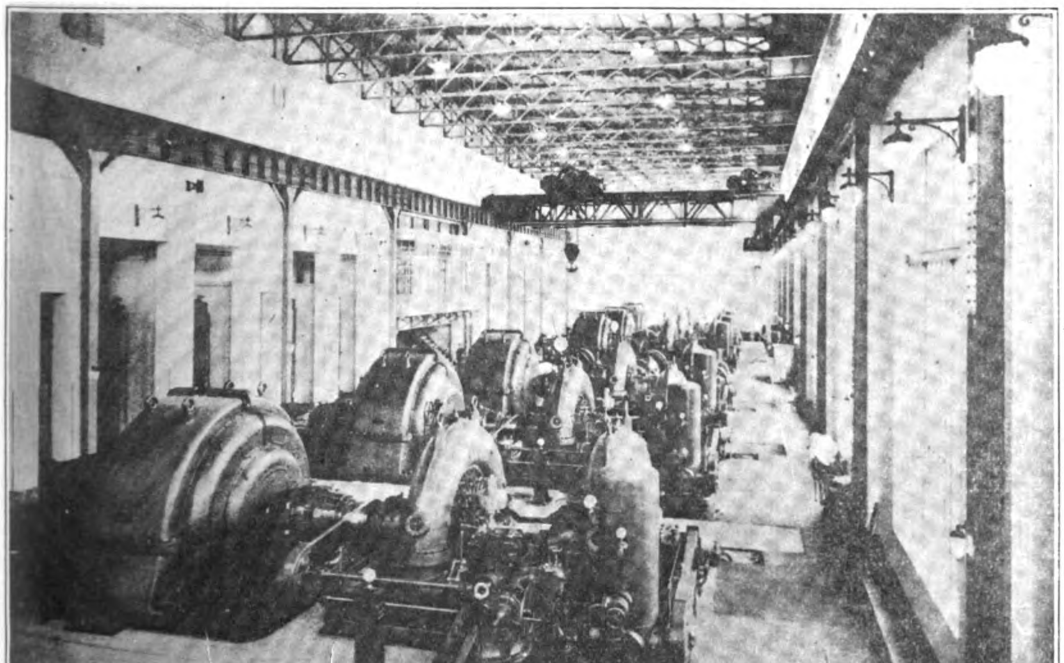
Generator and Turbine (English Electric Co., Ltd), Dick, Kerr Alternators, and J. M. Voith Water Wheels

NO. 3 POWER CANAL.—The intake is placed near by the tail-race of No. 2 power house. The total length of the head canal is 5,670-ft., consisting of one tunnel, 2,450-ft., and one open canal, 3,220-ft. long. There are four (one for spare) main pipe lines, inner diameter about 7-ft. 6-in., under an effective head of 133-ft. The water from the turbine discharges directly into the common tail-race. The total length of the tail-race is 1,300-ft., consisting of one open canal. The grade of the head canal is similar to that of No. 1 Power Canal.

NO. 4 POWER CANAL.—The intake is located at Uchigoe in Bandai village, about one mile and quarter down stream from No. 3 Power House. The total length of the canal is 11,160-ft., consisting of tunnels aggregating 1,590-ft. and open canals aggregating 9,570-ft. in length. There are four (one spare) main pipe lines, inner diameter about 7-ft. 6-in., under an effective head of 211-ft. The water from the tail-race of the power house discharges directly into the Nippashi River. The grade of the canal is similar to that of No. 1 Power Canal.

ONOGAWA POWER CANAL.—The intake is located on the south-eastern shore of Lake Onogawa. Total length is 6,550-ft: consisting of one tunnel and one open canal. There are two main pipe lines, inner diameter about 6-ft., under an effective head of 202-ft. The water from the tail-race of the power house discharges directly into Lake Akimoto. The grade of the canal varies from 1-ft. per 1,200-ft. to 1-ft. per 1,500-ft.

KAWAKAMI POWER CANAL.—The intake is located on the south-western shore of Lake Akimoto. Total length, 11,430-ft., consisting of one tunnel and one open canal. There are four (one spare) main pipe lines, inner diameter about 6-ft. 6-in., under an effective head of 274-ft. The water from the tail-race of the power house discharges into the Nagase River. The grade is similar to that of the Onogawa power canal.



General View of Generating Room, Power House No. 1

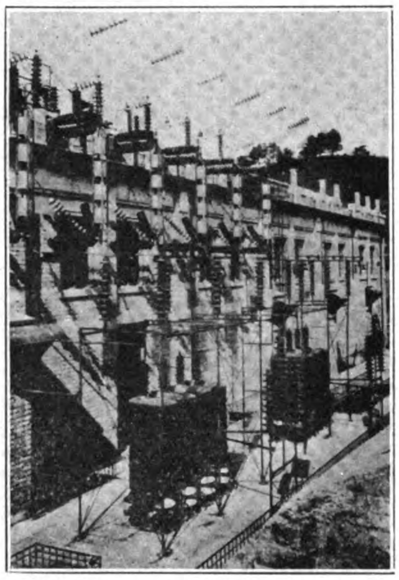
MYOKA POWER CANAL.—The intake is placed near by the tail-race of Kawakami power house. The head canal consists of one tunnel of 7,580-ft. long. There are four (one spare) main pipe lines, inner diameter about 6-ft. 6-in., under an effective head of 288-ft. The water from the turbine discharges into the Nagase River through a tunnel and an open canal. The grade is similar to that of Onogawa power canal.

NAGAMINE CANAL.—The intake is located on the south-eastern shore of Lake Hibara and the discharge end at the south-western shore of the Lake Onogawa. Total length of the canal is 5,070-ft. consisting of one tunnel and two open canals. This canal is to be used to discharge the reserve water in Lake Hibara.

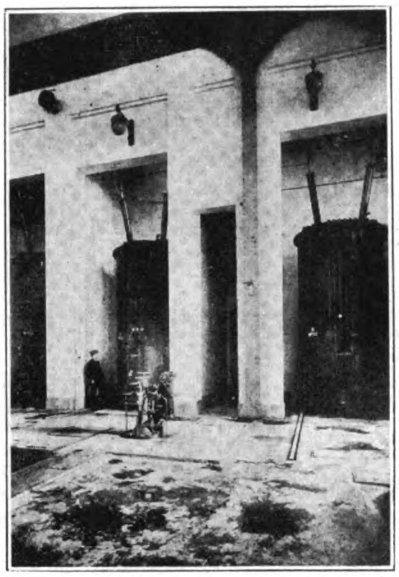
Power Houses

Power is generated by alternating current generators, direct coupled to

water turbines, in three-phase, 6,600-volt, three-wire system. It is stepped up by transformers to 115,000 volts, and transmitted to the city of Tokyo. The line voltage at Tokyo, the receiving end of the line, is calculated to be 100,000 volts, which is stepped down by transformers to 11,000 volts and then distributed by underground cables to consumers in Tokyo and its suburbs. Power for small consumers in the neighborhood of the receiving station is supplied directly from the station by 3,300 volt transformers connected to the 11,000-volt-bus bar of the station. Power consumed in the neighborhood of the generating station is supplied at 6,600 volts.



High Tension Lightning Arresters



Main Transformers

The generating units in the seven stations will be as follows:

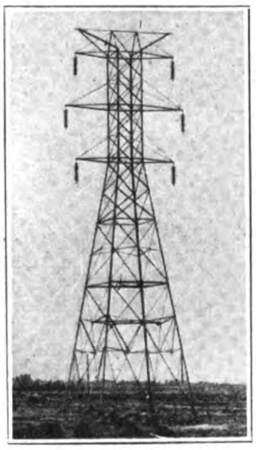
No. 1 Power House.—Six sets (including one spare set) of 11,250 h.p. turbines and 7,777 k.v.a. generators.

No. 2. Power House.—Five sets (including one spare set) of 10,250 h.p. turbines and 6,666 k.v.a. generators.

No. 3. Power House.—Four sets (including one spare set) of 7,500 h.p. turbines and 4,800 k.v.a. generators.

No. 4. Power House.—Four sets (including one spare set) of 11,500 h.p. turbines and 7,500 k.v.a. generators.

Onogawa Power House.—Two sets of 7,200 h.p. turbines and 4,600 k.v.a. generators.

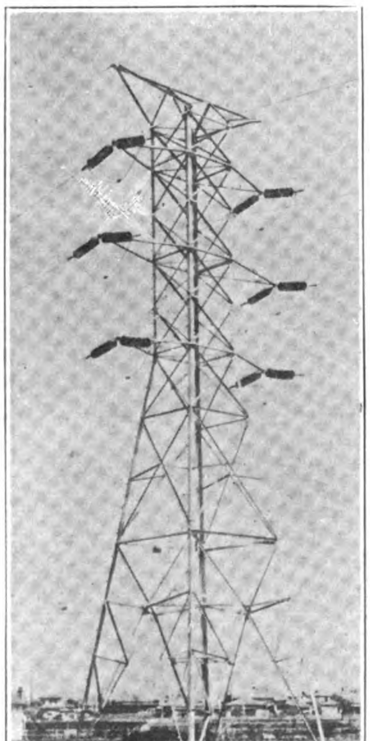


Type "A" Tower

Kawakami Power House.—Four sets (including one spare set) of 9,400 h.p. turbines and 6,000 k.v.a. generators.

Myoka Power House.—Four sets (including one spare set) of 9,400 h.p. turbine and 6,000 k.v.a. generators.

The main transmission line of bare copper cables suspended on steel towers, as well as tie lines between adjacent generating stations, will carry 115,000 volts. The main transmission line consists of two tower lines, each carrying two circuits thereon, while the tie line has only one tower line, carrying also two circuits.



Type "B" Tower

Reliable Water Supply

As far back as 1878, Mr. Van Dorn, a Dutch engineer, investigated and reported upon a plan for a vast tract of rice lands belonging to Asaka county. This plan provided for a maximum water supply of 200 cubic feet per second, drawn from Lake Inawashiro at Yamagata, a small village on its eastern bank. The Asaka Irrigating Association was then organized and with official approval erected the reglating gates called "Juroku-kyo," at Tonokuchi, at the mouth of the Nippashi River, the one outlet of Lake Inawashiro. From that date a watchman has been stationed to regulate the gates so as to maintain the lake at a constant level (within a certain margin) and keep a record of the water levels both inside and outside of the gates. These records show that the volume of water in the Nippashi River is amply sufficient to provide for the plans of the new enterprise.

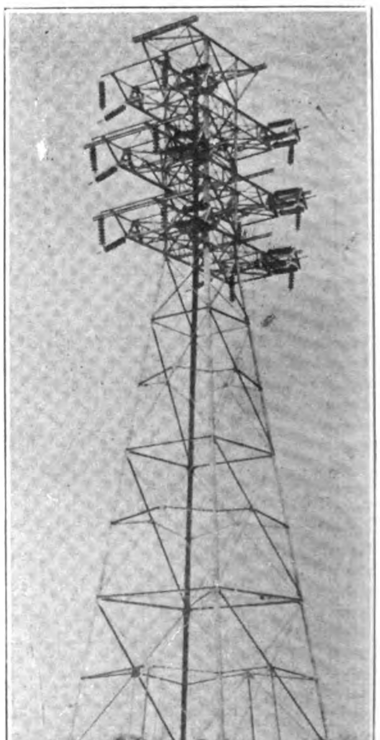
Flexibility of Supply

In regard to the regulation of the "Jurcku-kyo" gates, the Association fixed the limits of high and low-water levels of Lake Inawashiro, so as to prevent the overflowing of the lake or a scarcity of water in the irrigation canal. The quantity of water in the lake included within these two extreme levels, can be utilized as storage for the hydro-electric power plant.

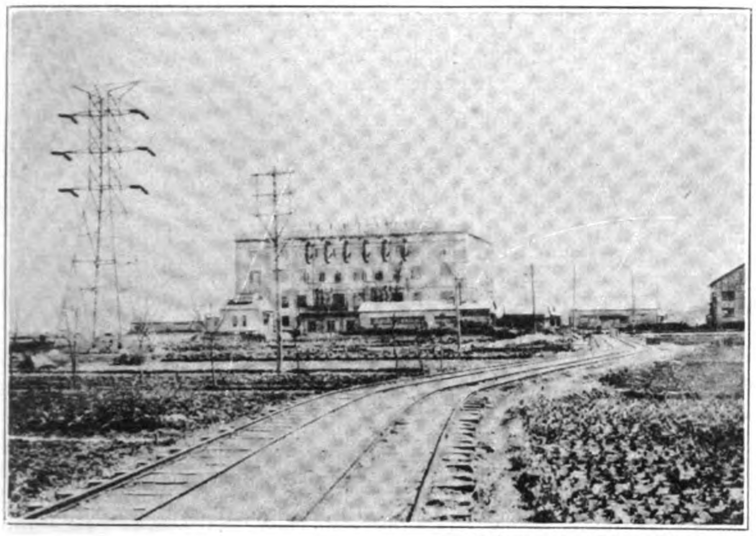
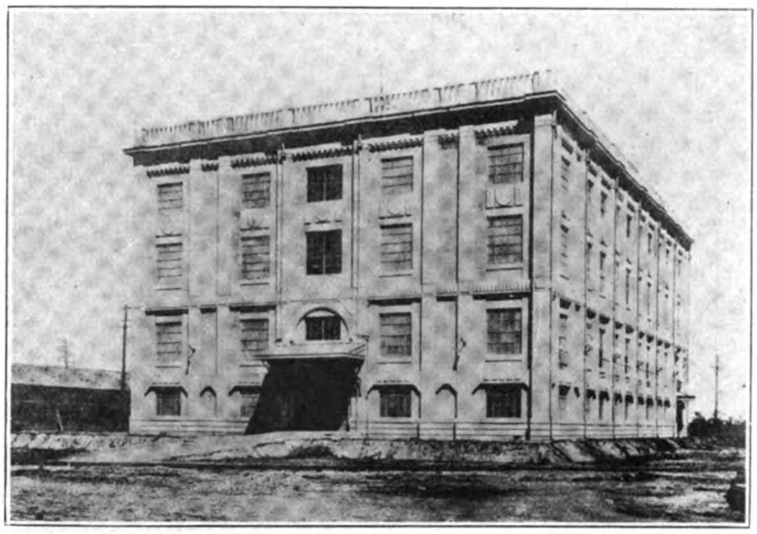
As Lake Inawashiro covers about 42 square miles, and the difference of the two extreme levels is 3.2 feet, there is storage capacity of about 3,500 million cubic feet. The rights to use this volume of storage water were acquired by the Inawashiro Hydro-Electric Power Co. Moreover, the company also secured the right to use Lakes Hibara, Onogawa and Akimoto as storage reservoirs, and a dam was built at the outlet of each. The storage capacity of these three lakes is 4,200, 330 and 1,100 million cubic feet, respectively. The total storage capacity in the four lakes is figured to be not less than 9,100 million cubic feet. With such a large reservoir close to power houses, the Inawashiro enterprise can always rely on an ample water supply, with no danger of floods in the river. These resources enable the company to construct and manage its power houses under most safe and economical conditions.

Construction Work

Although Lake Inawashiro is encircled by a range of high mountains and the fall of the Nippashi River bed is so steep that the rapids are about ten miles long, the general character of both banks of the river is very flat. Therefore, the aggregate length of the power canals along the Nippashi River, consisting mostly of open canals cut in flat country, is not more than about 30,000 feet for the total effective head of 924.6 feet. Moreover, there are a number of railway stations around Lake Inawashiro and the Nippashi River, within easy access to the power canals and power houses, which help to facilitate and cheapen the cost of construction.



Tone River Crossing Strain Tower

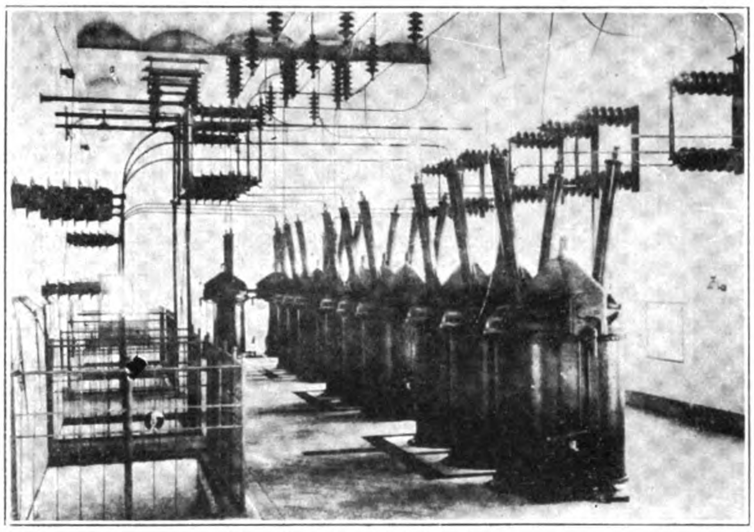



Tabata Receiving Station, Tokyo, Front and Rear Views

First and Second Installations

Renewal of "Juroku-kyo," construction of generating station No. 1, transmission line, A (two circuits), telephone line and Tabata receiving station, were included in the the first installation. This was completed and passed by the government on March 15th 1915, since when it has been in actual service.

Construction of dams at the outlets of Lakes Hibara, Onogawa and Akimoto, construction of No. 2 generating station, transmission line between No. 1 and No. 2 generating stations, and synchronous condenser equipments in Tabata receiving station were the features of the second installation. This was completed and passed by the government on August 1st, 1919, since when it has been in active operation.



High Tension Switch Room

"Juroku-Kyo"

"Juroku-kyo" erected by the Asaka Irrigating Association, is a stone masonry bridge across the Nippashi River at the outlet of the lake with fifteen piers, each pier serving as a support for sluice gate which regulates the level of Lake Inawashiro. It is to be now reconstructed, for the exclusive use of traffic, while new gates for regulating the water level are to be constructed at a point 60-ft. down-stream. These new gates will regulate the flow of water in the Nippashi River within the restrictions imposed by the government for maintaining a certain level in Lake Inawashiro.

The general features of these regulating gates are as follows :

Total Length of Regulating Gates : 250-ft.

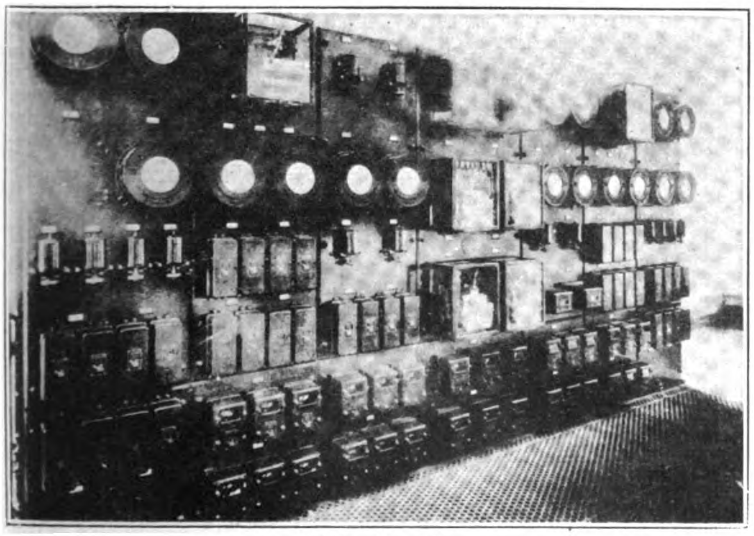
Number of Gates.—Sixteen in all. Thirteen are to let the water flow into the Nippashi River for the company's use ; the remaining three are for other water users.

Piers.—Fifteen in all ; thirteen are four feet thick, and two six feet thick.

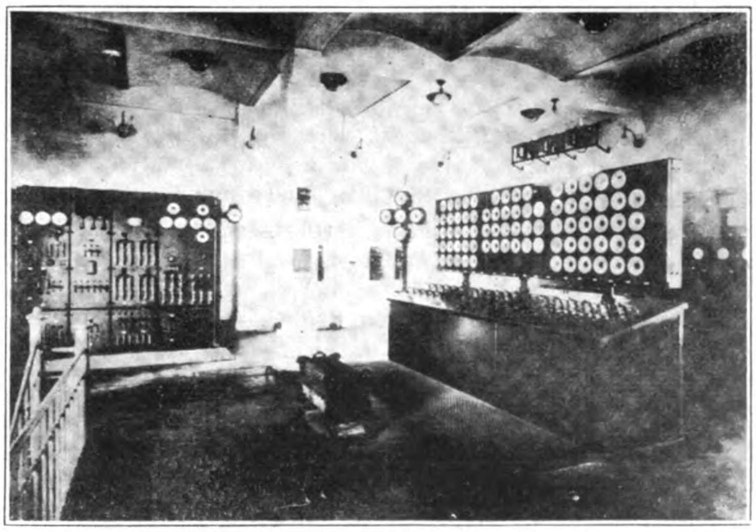
Gates.—All gates are made of steel, operated by either by hand or electric motor. They are nine feet high, with twelve feet span for thirteen gates and ten feet for the remaining three.

Lake Hibara

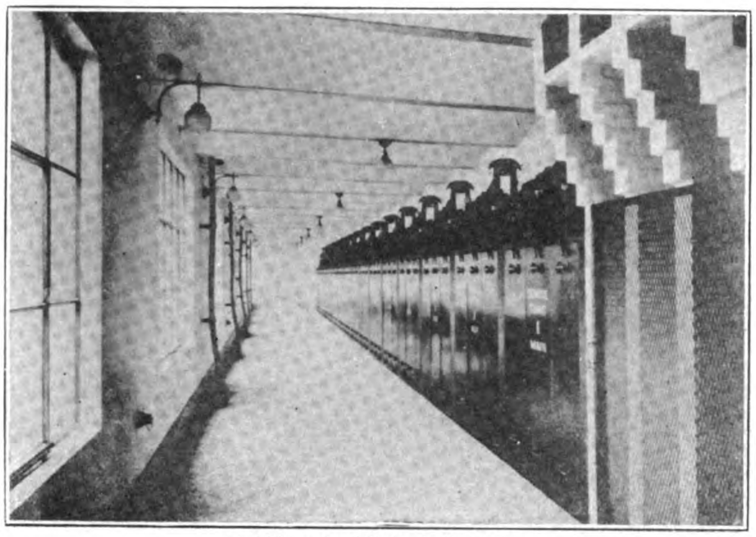
A dam and regulating gates were constructed at the natural outlet of Hake Hibara in order to convert the lake into the company,s reservoir. The general features of the dam and regulating gates follows.



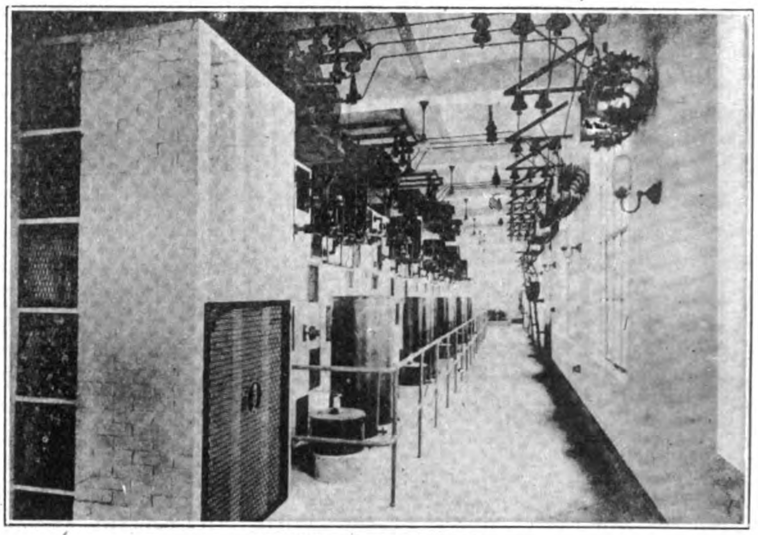
Relay Board



Main Control and Service Board



11,000 volt Oil Switch Room



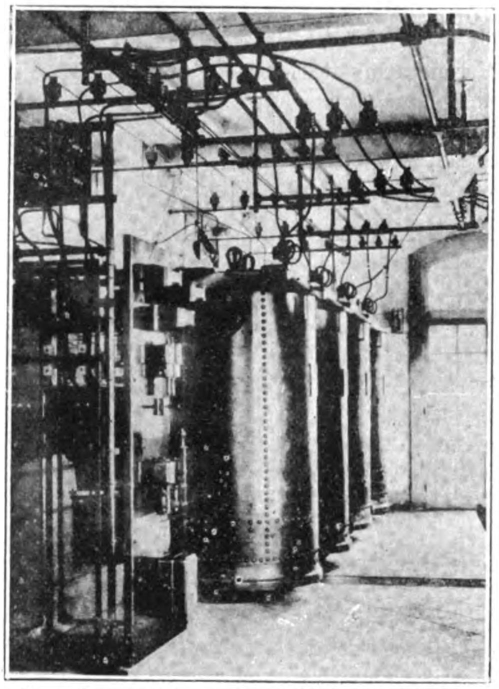
11,000 volt Busbar Room

(*a*) DAM.—Type, overflow type with parabollic down stream surface, with flash-boards for one section: length, total, 783 feet; length of dam with flash-boards, 624 feet, without flash-boards, 159 feet: height, 27.5 feet at highest part: height of flash-boards, 2 feet: structure, concrete with rubble stone facing.

(*b*) GATE.—Total length of structure, 35-ft.: height, 27.5 feet: width, 24 feet: number of gates, 2: size of gate hole, 6 feet wide, 6 feet high: gate, hand operated wooden gate, 7 feet high: piers, concrete without stone facing.

(*c*) RESERVOIR CAPACITY.—Useful depth of water, 18 feet: quantity of water reserved, 2,100 million cubic feet.

In order to increase the storage capacity of the lake, a canal from the south-eastern shore of this lake to the south-western shore of Lake Onogawa is now being constructed. After its completion, the useful depth and quantity of water stored in the lake will be 43 feet and 4,200 million cubic feet, respectively.



Transformer Room for Oji Electric Railway

Lake Onogawa

Gates and dam have been constructed at the natural outlet of Lake Onogawa in order to convert the lake into a company reservoir. These consist of regulating gates and a gate for floating timber, with earth and syphon dams. The regulating gates are situated at the centre, with the syphon dams on booth sides while the gate for floating timber is at one side of the syphon dam and the earth dams at both ends. The general features are as follows:

(*a*) REGULATING GATES.—Total length of structure, 33 feet: total height, of structure, 29 feet: total width, of structure, 23.2 feet: number of gates, 2: size of gate hole, 5.6 feet wide, 5.6 feet high: gate, hand operated wooden gate, 7 feet high: pier, concrete.

(*b*) SYPHON DAMS.—Total length, 120 feet: number of syphon, 6: section of syphon, 6 feet square: head of syphon, 11.9 feet: total capacity of six syphons, 3,500 cubic feet per second: structure, concrete dam. Reinforced concrete syphon.

(*c*) GATE FOR FLOATING WOOD.—Height of gate, 6.5 feet: width, 5 feet: type, log gate.

(*e*) EARTH DAM.—Length, 102 feet: width at top, 15 feet: slope, 1 foot in 2.5 feet: front surface, rubble stone facing; back surface, lawn facing.

(*f*) RESERVOIR CAPACITY.—Useful depth of water, 105 feet: quantity of water stored, 220 million cubic feet.

After the completion of the Onogawa generating station, the useful depth and quantity of water stored in the lake will be 29 feet and 330 million cubic feet, respectively.

Lake Akimoto

Gates and dams have been constructed at the natural outlet of Lake Akimoto. In addition to the regulating gates, there is one for floating timber with syphon dams, masonry and earth dam. The regulating gates are situated at the centre, with syphon dams at both sides of the regulating gates; the gate for floating timber at one side of the syphon dam and the earth and masonry dams at both ends. The general features are as follows:

(*a*) REGULATING GATES.—Total length of structure, 39 feet: height, 37 feet: width, 22 feet; number of gates, 2: size of gate holes, 5 feet high, 5 feet wide: gate, hand operated wooden gate, 6 feet high: pier, concrete.

(*b*) SYPHON DAMS.—Total length, 86 feet: number of syphons, 4: section of syphon, 6 feet square: head of syphon, 19.5 feet: total capacity of four syphons, 2,550 cubic feet per second: structure, concrete for dam; reinforced concrete for syphon.

(*c*) TIMBER GATE.—Height, 6 feet: width, 5 feet: type, log gate.

(*e*) EARTH DAM.—Length, 1,290 feet: mean height, 33 feet: width at top, 24 feet: slope, 1 foot in 2.5 feet: front surface, rubble stone facing: back surface, lawn facing.

(*f*) MASONRY DAM.—Type, overflow with parabolic down stream surface: length, 582 feet: mean height, 19 feet: width at top, 3 feet: structure, concrete with rubble stone facing.

(*g*) RESERVOIR CAPACITY.—Useful depth of water, 20 feet: quantity of water stored, 750 million cubic feet.

After the completion of the Kawakami generating station, the useful depth and quantity of water stored in the lake will be 39 feet and 1,100 million cubic feet, respectively.

Power Canal for No. 1 Generating Station

The total length, covering several sections of open canals, conduits, tunnels and aqueducts, is nearly 7,920 feet. The grade is one to two thousand for the upper section of 5,760 feet and one to fifteen hundred for the remaining section. The cross section

of the canal is adequate for a flow of 1,600 cubic feet of water per second. A brief description of the work, follows :

(*a*) Headworks.—This consists of an overflow dam across the river, with an intake for the power canal adjacent to the dam. The dam is designed to pass a maximum of 6,000 cubic feet of water per second over its spillway and 4,000 cubic feet per second through the sluice gates, a total of 10,000 cubic feet per second.

(1) Dam.—Type, overflow type with parabolic down stream surface: length, total, 389 feet; length of overflow proper, 238 feet, the remainder is taken up by the sluice gates: width at top, 5 feet: height, 18 feet from river bed: width at base, 40.5 feet: structure, concrete with rubble stone facing: sluice gates, there are two stoney type hand operated sluice gates, each 8 feet wide, 10 feet high.

(2) Intake.—Situation, about 5,580 feet down-stream from "Juroku-kyo" and on the up-stream side of the dam: intake gate, there are four stoney type hand or motor operated sluice gates, each 8 feet wide and 10 feet high: piers, concrete with brick and cut stone facing.

(*b*) Open Canal.—Length, 5,410 feet, covering four separate sections from No. 1 to No. 4: structure, the canal is of concrete lined with cement mortar. There are four different standard sectional forms corresponding to the nature of soil and grade of canal. Thickness of concrete varies from 1 foot to 3 feet for the side walls and 1 foot throughout for the bottom. At the part where earth cutting was made, a bench of six feet wide is installed.

(*c*) Conduit.—Length, there are five sections, with an aggregate length of 704 feet: structure, cross section of the conduit is horse-shoe shape. The arch is constructed of reinforced concrete, while the side wall and invert of plain concrete. All the surface is lined with cement mortar. The earth cover on arch is 4 feet thick.

(*d*) Tunnel.—Length, there are two sections, the first, 1,200 feet long, and the second, 275 feet long: structure, cross section of the tunnel is horse-shoe shape, 17 feet in height and radius. The side wall and invert are made of concrete, while the arch is brick work backed with rubble. All the surface is lined with cement mortar.

(*e*) Aqueduct.—Length, there are two aqueducts in the canal, the first 218 feet long and the other 268 feet long: structure, flume and supporting piers are made of reinforced concrete. Cross section of the flume is supported by a row of three columns, each 18 inch square, at intervals of 16 feet. The thickness of the flume is 17 inches at the side walls and 24 inches at the bottom.

(*f*) Forebay.—Size, 88 feet long by 122.5 feet wide: area, 10.780 square feet: depth, from 18 feet 10 inches to 21 feet 10 inches: sluice gate, there are eight stoney type hand or motor operated sluice gates, of which, six are for the main penstocks, one for exciter penstock, and one for the spillway. The size of each of the first ix sis 11 feet wide and 14 feet high, of the next, 4 feet wide and 11 feet high; and the last, 11 feet wide and 10 feet high: structure, side walls and bottom are of concrete work lined with cement mortar. Some parts are lined with brick and cut stone.

(*g*) Spillway.—The water spilled from the head by the syphon dam discharges to the river at a point about 300 feet down-stream of power house.

The total length of the spillway is about 1,420 feet including vertical well, conduit, open canal and pipe. The well is 10 feet diameter, 29 feet deep, 3 feet thick, made of concrete with cut stone facing. The conduit is 115 feet long, 7 feet wide, 9.6 feet high from invert to arch crown, lined with cut stone, and built on 1 to 33 slope. The open canal, trapezoidal in form, is lined with rubble stone laid in cement mortar. The bottom width is 6 feet, depth 8 feet, and the side slope 1 to 0.5. The slope of the canal bed is divided in four parts. The first 67 feet has a slope of 1 to 0.5, the second 392 feet, 1 to 2.8 feet, the third 267 feet, 1 to 5.0 and the fourth 276 feet, 1 to 100. The pipe is 285 feet long, 6 feet in diameter, made of rivetted mild steel plate of three-eights inch thick.

No. 1 Generating Station

(*a*) Name, No. 1 Generating Station of the Inawashiro Hydro-Electric Power Company, Limited.

(*b*) Situation.—Nippashi-mura, Kawanuma-gun, Fukushima-ken, Japan.

(*c*) Building.—Main building of the generating station consists of two parts: the generating and transformer rooms. The generating room is a single story steel frame brick building, 249 feet long, 66 feet wide, and 44 feet high, measured from ground floor to bottom of roof truss. The transformer room is a three story steel frame brick building, 249 feet long, 38 feet wide and 59 feet high from ground floor to bottom of roof truss.

(*d*) Penstock. (1) Main Penstock.—Inner dia., four kinds of 2.25 m., 2.13 m., 2.01 m. and 1.9 m. from top to bottom.

Thickness.—Twenty-eight kinds from 10 mm. to 20.6 mm: length, 1,348 feet, average of six pipe lines: material, welded pipe made of Siemens-Martin mild steel: joint, bump joint: number, six pipe lines, of which one is spare. Maker, Thyssen & Company, Germany.

(2) Exciter Penstock.—Inner dia., four kinds of 0.8 m., 0.75 m., 0.7 m., and 0.65 m. from top to bottom: thickness, 8 mm. throughout: length, nearly 1,338 feet: material, welded pipe made of Siemens-Martin mild steel: joint, muff joint: number, one. Maker, Thyssen & Company, Germany.

(*e*) Water Turbines.—(1) Main turbine, type, horizontal Francis double spiral turbine: effective head, 104 metres: capacity, 11,250 h.p. at full gate opening: speed, 375 r.p.m.: number, six, of which, one is spare. Maker, J. M. Voith, Germany.

(2) Exciter Turbine.—Type, horizontal impulse turbine: effective head, 98 metres: capacity, 492 h.p. at full gate opening: speed, 500 r.p.m.: number, four, of which, two are spare. Maker, J.M. Voith, Germany.

(*f*) Generators.—Type, totally enclosed forced draught horizontal shaft alternating current generator: capacity, 7,000 k.w.: power factor, 90 per cent.: phase, three phase: voltage, 6,600 volts: frequency, 50 cycles per second: speed, 375 r.p.m.: connection, star, the neutral grounded through resistance: excitation, exciting current is supplied from separate exciter plant: number, six of which one is spare. Maker, Dick, Kerr & Co., England.

(*g*) Exciter.—Type, horizontal shaft direct current generator: capacity, 200 k.w: voltage, 250 volts: speed, 500 r.p.m.: connection, 2 wire system: excitation, shunt wound self-excitation: number, four, of which, two are spare. Maker, Dick, Kerr & Co., England.

(*h*) Main Transformers.—Phase, single: capacity, 4,400 k.v.a.: voltage at high-tension side, 115,000 volts: voltage at low-tension side, 6,600 volts: frequency, 50 cycles: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, twelve, of which three are spare. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

(1) Switching and other Apparatus.—The switching apparatus and switchboards were made by the Westinghouse Electric & Manufacturing Company. Tirrill voltage regulators and Nicholson's arc suppressors are installed. There are one 55-ton and one 10-ton electric traveling crane, the former supplied by Jospeh Booth & Brothers, England, and the latter by Carrick & Richie, England.

Power Canal for No. 2 Generating Station

The total length of the power canal, embracing one open canal and one tunnel, is nearly 3,990 feet. The cross section of the canal is adequate for the flow of 1,600 cubic feet of water per second with a grade of 1 foot in 1,500. A brief description of each section of the work, follows :

(*a*) Head Works.—This consists of an overflow dam across the river, and an intake for the power canal adjacent to the dam.

(1) Dam.—Type, overflow type with parabolic down stream surface: length, 110 feet: height, 225 feet from river bed: width, 8 feet at top and 31.6 feet at base: structure, concrete

with rubble stone facing: sluice gate, one stoney sluice gate, 9 feet wide and 9.6 feet high.

(2) INTAKE.—Situation, about 1,000 feet down stream from No. 1 power station: sluice gate, two hand or electrically operated stoney sluice gates, each 18 feet wide and 14 feet high: piers, concrete, with brick and cut stone facing.

(b) TUNNEL.—Length, 2,220 feet: size, cross section of tunnel is horse-shoe shape, 17 feet in height and radius.

(c) OPEN CANAL. Length, 1,770 feet: structure, concrete, thickness, 1.2 feet for side wall and 1 foot for bottom.

(d) FOREBAY.—Size and depth, 139 feet long, 81 feet wide, 19.29 to 22 feet deep: sluice gate, there are five hand and motor operated main stoney sluice gates for main penstock and a hand operated stoney sluice gate for the spillway. The size of each of the first five is 12.6 feet wide, while that of the latter is 4 feet wide and 4 feet high: structure, side wall and bottom are of concrete.

(e) SPILLWAY.—The water spilled from the forebay by syphon dam discharges into the river. Length, 1,060 feet, including 129 feet tunnel: structure, concrete and rubble stone masonry.

No. 2 Generating Station

(a) NAME.—No. 2 Generating Station of Inawashiro Hydro-Electric Power Co., Ltd.

(b) SITUATION.—Nippashi-mura, Kawanuma-gun, Fukushima-ken, Japan.

(c) BUILDING.—The main building of the generating station consists of two parts: generating and transformer rooms. The generating room is a single story steel frame brick building, 171 feet long, 66 feet wide, and 44 feet high, measured from ground floor to bottom of roof truss. Transformer room is a three story steel frame brick building, 205 feet long, 36 feet wide, and 44 feet high, from ground floor to bottom of roof truss.

(d) PENSTOCK.—Inside diameter, 7.87, 7.4, 7.0, 6.5 and 6.0 feet: thickness, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ inches: length, 955 feet in average of five penstocks: material, rivetted mild steel: number, 5, including 1 spare. Maker, Tokyo-Ishikawajima Shipbuilding Co., Ltd.

(e) WATER TURBINE.—Type, horizontal twin spital Francis type turbine: effective head, 226.5 feet at full gate: capacity, 10,250 h.p. at full gate: speed, 375 r.p.m.: number, 5, including 1 spare. Maker, Kobe Works of Mitsubishi Dockyard & Shipbuilding Co., Ltd.

(f) GENERATOR.—Type, totally enclosed forced draught horizontal shaft alternating current generator: capacity, 6,000 k.w: power factor, 0.9: phase, three phase: voltage, 6,600 volts: frequency, 50 cycle per second: speed, 375 r.p.m.: connection, star, neutral point grounded through resistance: excitation, excited singly with direct connected exciter: number, 5, including 1 spare. Maker, Shibaura Engineering Works, Ltd.

(g) EXCITER.—Type, overhang type direct current generator: capacity, 65 k.w.: voltage, 250 volts: speed, 365 r.p.m: connection, 2 wire: excitation, self-excited shunt wound with interpoles: number, 5, including 1 spare. Maker, Shibaura Engineering Works, Ltd.

(h) MAIN TRANSFORMER.—Capacity, 4,400 k.v.a: phase, single phase: voltage at high-tension side, 115,000 volts: voltage at low-tension side, 6,600 volts, with two 2.5 per cent. low voltage taps: frequency, 50 cycles per second: connection, delta connection in both high and low-tension sides: cooling, oil immersed water cooling: number, six. Maker, Shibaura Engineering Works, Ltd.

(i) SWITCHING AND OTHER APPARATUS.—All switching apparatus and switchboards were made by the Shibaura Engineering Works, excepting the 115,000 volt lightning arresters from the Westinghouse Electric & Mfg. Co. There is one 50-ton overhead traveling crane made by the Tokyo-Ishikawajima Shipbuilding Company. A special device is used for inter-connected voltage regulation of No. 1 and No. 2 generating stations.

Transmission Lines

There is one 115,000 volt transmission line between No. 1 generating station and the Tabata receiving station, and between No. 1 and No. 2 generating stations, also, one 6,600 volt transmission line between No. 1 and No. 2 generating stations.

(A) 115,000 VOLT TRANSMISSION LINE.—(a) Length, between No. 1 generating station and Tabata receiving station, 140.1 miles: between No. 1 and No. 2 generating station, 1 mile.

(b) CONDUCTOR.—Size, seven strand of 168 mill wires, nearly 0.51 inches outside diameter, 197,600 circular mills in cross section: material, hard drawn copper: number, six cables are strung on one tower making up two 3-phase 3-wire circuits: sag, for standard span of 550 feet, at maximum temperature, the clearance of the lowest cable above ground is 27.7 feet and sag of the cable is 15.73 feet: arrangement, six cables are arranged in two vertical rows, having the middle cables placed 2 feet outside the rest. Horizontal distance of two rows at the middle cable is 23 feet 6 inches in A tower and 24 feet 6 inches in B and C towers. Vertical distance of adjacent cables is 10 feet for all standard towers: transposition, no special transposition tower is used. Maker, Furukawa & Co., Japan.

(c) GROUND CABLE.—Size, seven strand of 125 mill wires, about $\frac{3}{8}$-in. in outer diameter: material, galvanized Siemens-Martin steel: number, two on one tower: arrangement, two ground cables are fixed at both ends of top arm, 19 feet 6 inches apart at A tower and 20 feet 6 inches apart B and C towers. Maker, Roebling & Company, U.S.A.

(d) TOWERS.—There are three standard types of towers:

STANDARD TOWER "A": A towers are to be erected at points where lines are straight or turn at an angle less than six degrees. Conductors are suspended by the use of the suspension insulators and ground cables fixed at the top arm.

STANDARD TOWER "B": B towers are of special strength to bear the strain of all six conductors and the two ground cables. They serve for diminishing the vibration of conductors and also to prevent any extension of damage to the tower line when any one of the A towers fail. They are erected at every twentieth tower, and at points where the line angle exceeds thirty degrees. Conductors are secured by the use of strain insulators, and ground cables fixed at the top arm.

STANDARD TOWER "C": C tower, is a still stronger tower, designed to resist the transversal pull on line angles of thirty degrees, and are used at points where the line angle is more than six degrees but less than thirty degrees. Conductors are fixed by the use of strain insulators, and ground cables fixed at the top arm.

SPECIAL TOWER: Besides the above-mentioned three standard towers, there are many special towers for crossing rivers, such as Tone, Kinu, Ara, etc., and for crossing extra high-tension transmission lines belonging to other companies.

A rough description of the tower is as follows:

Standard Span, 550 feet: actual average span, 516 feet: longest span, two 1,530 feet making total length at 3,060 feet (crossing the River Tone): material, galvanized mild steel, with sherardized bolts: height, A tower, 72 feet 9 inches; B tower, 72 feet; C tower, 72 feet: base, A tower: square of 18-ft. $8\frac{10}{16}$-in. side; B tower: square of 19-ft. $7\frac{1}{4}$-in. side; C tower, square of 19-ft. $7\frac{1}{4}$-in. side: weight, A tower, 5,890-lbs. (excluding anchorage); B tower, 12,160-lbs. (excluding anchorage); C tower, 9,900-lbs. (excluding anchorage).

FOUNDATION.—Towers are set on galvanized mild steel anchorge. Where the bearing power of soil is not strong enough, concrete and piling are to be added. Weight of anchorage is as follows: A tower, 803-lbs.; B tower, 4,413-lbs.; C tower, 2,858-lbs.

NO. OF TOWERS.—Number of towers erected is as follows: A tower, 1,128; B tower, 112; C tower, 175: special tower, 34: total 1,449. Maker, American Bridge Company, U.S.A.

(e) INSULATORS.—Type, suspension type: Material, porcelain: number of units per string, seven for suspension insulator, eight for strain insulator: size, diameter of shell, 12

inches. Distance of centres of connecting pins, 5½-in.: test voltage, dry test: 70,000 volts for 5 minutes for one unit. 380,000 volts for 1 minute for seven units, in one string.

West Test: Under a jet of distilled water directed at 45 degrees to the string, at the rate of precipitation of 0.2 in per square inch per minute. 45,000 volts for 5 minutes for one unit. 290,000 volts for 1 minute for 7 units in one string: mechanical test, under tension of 5,000-lbs. on sign of yielding allowed, but it breaks at above 10,000-lbs. Makers, R. Thomas & Son Company, U.S.A.; Nippon Insulator Co., Ltd.; Shofu Insulator Co., Ltd.

(*f*) SWITCHING STATIONS.—Three switching stations are installed along the transmission line, spaced nearly equally at Shirakawa, Utsunomiya, and Koga, for the purpose of exchanging the sections of the circuits. The installations are of the outdoor type, provided with hand operated oil switches. The switching apparatus was supplied by the Westinghouse Electric & Mfg. Co., but the switching tower structure was made by Ishikawajima Iron Works, Tokyo, Japan.

(*B*) 6,600 VOLT TRANSMISSION LINE—(*a*) Length, 1 mile: conductor: size, seven strand of 168 mil wires, nearly 0.51 inches in outside diameter, 197,600 circular mils in cross section: material, hard drawn wire: number, 6: dip, maximum dip at standard span of 150 feet is 2.5 feet: spacing, interaxial distance is 2.15 feet. Maker, Furukawa & Co., Ltd.

(*c*) POLE.—Standard span, 150 feet: maximum span, 192 feet: construction, the support is H form wooden pole using two creosoted *sugi* (a kind of cedar) poles of 32 feet length and 7¾ inch top diameter. The interaxial distance of poles at ground level is 5.4 feet and that at the top is 4.25 feet, and bottom of pole is 6 feet below ground level. Two 7-foot galvanized angle iron cross arms are attached to the poles at the points 1 foot and 3.25 feet below the top.

(*d*) INSULATOR.—Type, three petticoat pin type insulator: material, porcelain: size, maximum diameter, 5¼ inches: height, 4¼ inches: dry flashover voltage, over 55,000 volts. Maker, Nippon Insulator Co., Ltd.

(*C*) TELEPHONE LINE.—A separate telephone line is installed between generating and receiving stations and between generating stations, along the route of main transmission line. This telephone line comprises three 2-wire circuits as follows:

Circuit No. 1, for direct communication between the stations: No. 2, this is divided into two sections at Utsunomiya switching station, the middle point in the line. The first section is for communication between the generating station and Utsunomiya switching station, and the second section is for use between Utsunomiya switching station and Tabata receiving station. These two sections can be interconnected at Utsunomiya, with each other or to any one of No. 1 or No. 3 circuits, when necessary: No. 3, this is divided into four sections at three switching stations. Each section is for communication between adjacent switching stations and patrol men.

A brief description of the construction of this telephone line is as follows: Standard span, 180 feet: standard pole, 24 feet, Sugi pole, 6 inches in diameter at top end: Atm, Nara, impregnated with creosote: insulator, porcelain, double petticoat insulator: conductor, hard-drawn copper wire weighing 200-lbs. per mile: ground wire, one S.W.G. No. 8 galvanized iron wire is fixed at top of pole and connected to earth wire of it.

For special long spans crossing rivers, etc., special pole and copper clad steel wire are used. Besides heat coils, arresters and fuses, drainage coils and telephone transformers are installed as safety devices for the telephone instruments.

Tabata Receiving Station

(*A*) NAME.—Tabata Receiving Station of Inawashiro Hydro-Electric Power Company, Limited.

(*B*) SITUATION.—Near Tabata Railway Station, Tokyo, Japan.

(*C*) BUILDING.—There are two main buildings, i.e., transformer and switch house and synchronous condenser house. The first is a three story reinforced concrete building, 144 feet long, 85 feet wide, and 57 feet high from ground floor to bottom of roof truss. The last consists of the synchronous condenser room and switch room.

The synchronous condenser room is a single story brick building, 96 feet long, 40 feet wide, and 32 feet high from ground floor to bottom of roof truss. The switch room is a two story brick building, 21 feet long, 40 feet wide and 32 feet high.

(*D*) MAIN TRANSFORMERS.—Phase, single phase: capacity, 4,000 k.v.a.: voltage at high-tension side, 100,000 volts: voltage at low-tension side, 11,000 volts: frequency, 50 cycles per second: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, twelve, of which three are for spare. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

(*E*) AUXILIARY TRANSFORMERS.—These transformers are for supplying power to small consumers in the neighborhood of the station. They are as follows:

Phase, single: capacity, 500 k.v.a.: voltage at high-tension side, 11,000 volts: voltage at low-tension side, 3,300 volts: frequency, 50 cycles: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, nine, of which three are spare. Maker, Shibaura Engineering Works, Tokyo, Japan.

(*F*) SYNCHRONOUS CONDENSER.—Type, totally enclosed forced draught horizontal shaft synchronous condenser: capacity, 7,500 k.v.a. continuously and 9,000 k.v.a. for two hours: power factor, 0: phase, three phase: voltage, 11,000 volts: frequency, 50 cycles per second: apeed, 500 r.p.m.: connection, star: excitation, excited singly with direct connected exciter: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*G*) EXCITER OF SYNCHRONOUS CONDENSER.—Type, overhang type direct current generator: capacity, 60 k.w.: voltage, 250 volts: speed, 500 r.p.m.: connection, 2-wire system: excitation, self-excited shunt wound generator with interpoles: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*H*) STARTING MOTOR OF SYNCHRONOUS CONDENSER.—Type, alternating current three-phase wound rotor induction motor: capacity, 300 h.p.: voltage, 3,300 volts: frequency, 50 cycles per second: synchronous speed, 600 r.p.m.: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*I*) SWITCHING AND OTHER APPARATUS.—All the switchboard and switching apparatus was made by the Westinghouse Electric & Mfg. Co., excepting those for the synchronous condenser, made by the Shibaura Engineering Works.

There are one 40-ton and 1-ton overhead traveling cranes for main transformers and synchronous condensers respectively. The former is from the Whiting Foundry Co., U.S.A., the latter from the Tokyo-Ishikawajima Shipbuilding Company.

For testing insulators, etc., two testing transformers with necessary accessories are installed. Description of the testing transformers is as follows:

Phase, single: capacity, 150 k.v.a.: voltage at high-tension side, 360,000 volts: voltage at low-tension side, 2,000 volts: frequency, 50 cycles per second: cooling device, oil immersed self-cooling: number, 2. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

Material for two long-distance telephone lines has recently been shipped from Chicago to Japan by Western Electric Co. They will afford the first modern long telephonic communication system in the Japanese empire, one between Tokyo and Yokohama and the other between Osaka and Kobe. In the two cables are 55,000,000-ft. of copper wire weighing 350,000 pounds. The lead sheath used to encase the copper strands weighs more than 1,000,000 pounds. Cost is about $750,000.

The Far Eastern Review

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ENGINEERING FINANCE COMMERCE

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A New Japanese Attitude Towards China

AS one result of the prolonged anti-Japanese campaign, foreigners in China may have the satisfaction of calling upon their own governments for protection should the present political and military situation develop into a menace to foreign lives and property. No longer can the foreigner secretly cherish the hope that if the worst should come, Japan will act as the policeman of other nations in China. If internal disorders ever reach a stage where large bodies of foreign troops are required to protect foreign lives and properties, other nations must be prepared to incur the expense of dispatching and maintaining troops and assuming their full share of the after consequences with the Chinese people. Never again will Japan permit herself to be placed in a position where the presence of her troops in Chinese territory can be misinterpreted and so create suspicion and fear of her motives in the minds of the Chinese.

In view of the menacing outlook in the north and the general unstable conditions prevailing in other parts of China, it is well to pause and consider the effect of such a policy on the future relations between China and other countries. The consensus of opinion in Japan, both in official and commercial circles, is that Japan should hold aloof from intervention in China except that which might be absolutely essential for the protection of their own interests, and, even this should be undertaken only as a last resort. If conditions should unfortunately warrant the dispatch of foreign troops for the protection of lives and properties in China, the initiative will have to be taken by the other powers, so that no misunderstandings can be created in the minds of the Chinese as to Japan's position. The diplomatic corps at Peking has warned the Chinese government that in the event of grave disorders breaking out in the north, troops will be dispatched for the protection of the interests of their respective nationals. Restrained by an overwhelming popular sentiment that the time has arrived when a stop must be put to the further dispatch of troops into China and Siberia, the Japanese government will simply follow the initiative of the other powers. The Japanese people are "fed up" with these expeditions, and there is reason to believe, that they would prefer to have their nationals residing in the danger spots in China, concentrated in the ports, than be called upon at this juncture to send any large body of troops into the interior for their protection. They incline to the belief that if China's much discussed sovereignty is to be recognized and her government placed on a secure basis, the Chinese must be permitted to work out their own problems in their own way, free from undue outside pressure.

Highly placed Japanese seem to believe that the struggle between Wu Pei-fu and Chang Tso-lin places them in a most embarrassing position. It is no secret that foreigners have extended material and moral support to Wu Pei-fu, the "Hope of China," because of the suspicion that Chang Tso-lin is an instrument of Japan. These Japanese repudiate any direct connection between their government and the over-lord of Manchuria, who, they assert, has been able to attain his present strong position because of the fact that the provinces under his rule have enjoyed great prosperity as the result of Japanese initiative and enterprise, made possible by the presence of their railway guards insuring protection of the properties against bandit raids and unscrupulous tax gatherers. Chang, they say, is pro-Japanese only in so far as it suits his convenience to be so, the real link of understanding being one of appreciation arising out of the fact that whenever he requires extra funds, the resources of the Manchurian provinces can be relied upon to provide them without undue injury to their productivity. Chang Tso-lin, they declare, is not pro-Japanese or pro anything. Like every other Chinese leader he is out for himself, first, last and always. He is pro-Chang. These conditions have been exaggerated, say the Japanese, into the report that Chang is the instrument of Japan, which has provided foreigners with arguments which inclined them to extend moral and material support to Wu Pei-fu, not because the latter is any more patriotic or less of an adventurer than Chang, but because of their opposition to the spread of Japanese influence in China.

There can be little doubt that there exists considerable justification for the holding of such opinions in Japan, and there are equally strong reasons which justify foreign opposition to Chang Tso-lin. The free circulation of these reports has undeniably contributed to lining up opinion in China on the overworked issue of Japanese domination of the country through control of its government.

This anti-Japanese aspect of the present struggle for power is commented upon by nearly all the leading Japanese newspapers, who see in the warning of the diplomatic corps that the Peking-Mukden line must not be used for the transport of troops, a direct blow to Chang Tso-lin and a corresponding advantage to Wu Pei-fu. The *Tokyo Nichi Nichi* sensing this possibility, declares that if the action is traceable to a desire to assist Wu Pei-fu, it would prove the fickleness of the policies of other governments towards China, and then goes on to emphasize the real point at issue. Foreign intervention in the affairs of China at this time, which in any way obstructs the Chinese from solving their own problems in their own way, by providing undue advantage to any one faction will create a precedent that will deprive China of the advantages secured at the Washington conference. The theory that China's salvation must come from within will receive a rude set-back.

The outlook is not encouraging. If left to the Chinese to settle their own difficulties, it may take many years before the country is unified under a stable government. Foreign support either moral or material to any of the warring factions can serve only to make more difficult the protection of foreign lives and property in the interior. Little reliance can now be placed on the Chinese for such protection. From all parts of the country come reports of utter disregard of the rights of foreigners and refusal to pay adequate damages for properties and lives destroyed. The situation in Harbin has taught them that contempt for the foreigner can be practiced with impunity.

The tendency in Japan to keep aloof from intervention in the affairs of China and permit the warring factions to fight it out amongst themselves is, therefore, well worthy of serious thought. If conditions in this country should ever become so intolerable as to warrant the presence of foreign troops to protect lives and property we may well ponder over the number of divisions that would be required to properly police the territory adjacent to the main treaty ports. If present Japanese sentiment holds good in such an emergency (and there is every indication that they will refuse to shoulder any obligations other than those shared equally by all) it is time that other foreigners should ask themselves where all this is leading to. Japan has been maligned and traduced, suspected and accused of every ulterior motive that human ingenuity could think of, because, in the past, she has taken immediate steps for the protection of her interests whenever they have been placed in jeopardy through Chinese disorders. The Chinese have been carefully educated to believe that in the event of any serious internal disorders jeopardizing the lives and properties of foreigners, Japan would seize the opportunity to flood the country with troops, and,

in pursuit of her policy to dominate China, would never withdraw until the government was firmly under her control. This belief has taken a firm root in the minds of the Chinese, in evidence of which, only a few weeks ago, the Chinese chamber of commerce of Shanghai sent a telegram warning the Peking government against the possibility of Japan postponing the withdrawal of her troops from Shantung on the pretext of maintaining order there should war break out between the Chihli and Mukden factions. The bogey of Japanese armed intervention was calculated to frighten the Peking government into finding, at all hazards, a peaceful solution to the present situation.

The Japanese have learned their lesson. They decline to be made the policeman of China, and in the event intervention becomes necessary, it may be taken for granted that they will refuse to assume any obligation not shared equally by all other powers. Once the Chinese learn that they have little to fear from Japanese armed intervention in the event of internal disorders incidental to political unification; once this overworked bogey is eliminated from the scene, the consequences must strike home to of every thinking foreigner in the country.

We have put China to the test. If she fails to live up to our hopes and expectations and provides cause for armed intervention during the period of unification and reconstruction, public opinion in Japan will insist upon its government holding aloof as far as compatible with their actual interests, and permit other nations to apply their own remedies in their own way. The Japanese have learned that even if they should be called upon at a time of great stress to come to the rescue of foreigners in China, as soon as the danger is passed, gratitude would be replaced by distrust and the same agitators who launched the last anti-Japanese campaign would move heaven and earth to discredit their motives and shift the responsibility for intervention on to their shoulders. If trouble comes, other nations must be prepared to meet it fairly and squarely by the dispatch of their own troops. The people of America and Britain who will be called upon to foot the bills should be told the truth. If armed intervention in the affairs of China is to be the culmination of years of misrule and civil strife, it is well that both Chinese and foreigners alike should thoroughly understand the present trend of opinion in Japan, and prepare accordingly.

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The China Trade Act

IT has taken two years of hard work to get the "China Trade Act" into conference. The strongest argument in its favor was the placing of American companies on a plane of equality with those of other nations operating in China, which, stripped of superfluous verbiage, means exemption from federal taxes in order to compete with similarly favored British China companies. The strongest opposition to the bill emanated from the fear of home manufacturers that Chinese capital would incorporate under the law, using American citizens as a means to procure American protection and exemption from both Chinese and American taxation.

The most powerful argument advanced in support of the bill, was based on the favored position of the British companies, and the statement that Chinese capitalists, eager to co-operate with Americans in the establishment of new industries, were restrained from so doing, because they could more profitably invest in the tax-empted British concerns. This, of course, put a decided crimp into any hope of bringing about American-Chinese co-operation in the development of China's resources. The advocates of the bill, however, insisted that the British were favored by a special policy of their government who granted this exemption as a means of assisting British firms to capture the trade of China. In this, we are inclined to believe that a great mistake was made, much time and effort wasted, and the bill placed in jeopardy through misunderstanding, all arising from an immature knowledge of the facts surrounding the British position. The advocates of the bill simply jumped to certain conclusions, and in so doing, injured their own chances of success and placed the British in a false position before the American people.

The British position on tax-emption for registered companies and British subjects in China, far from being traceable to any secret policy of their government to favor its nationals in the fight to dominate Chinese trade, strange to relate, is based on a clear cut principle, one which lies at the very foundation of American liberties and conception of government.

The British position was very clearly set forth two years ago, when the British chambers of commerce in China voted to petition their home government to impose taxation on British firms and subjects in China, in order that they might contribute their share in paying the huge costs of the war. A most patriotic and laudable spirit. However, in the discussions which followed, one of the leading British jurists in China expounded the principles underlying the exemption from taxation and explained that "the proposal to levy an income tax on British subjects in China as a separate tax to be levied by the British government has to get over a great number of difficulties. In the first place we have to recognise that we enjoy extraterritorial rights in China, but no right is given to the British government to tax British subjects in China, which might amount to an infringement of China's sovereign rights.

"You will bear in mind that at present there are no taxes. There are certain fees payable, but all those fees are regarded strictly as fees for services rendered and not as taxes at all. In order to impose a tax on British subjects in China it would first be necessary to assume that such a thing would be allowed under the treaties, because the only ground upon which the king in council exercises his jurisdiction, is ground set out under the foreign jurisdiction act of 1890 for the purpose of carrying out the provisions of treaties."

"The foreign jurisdiction act gives no right to levy taxes and no right can be given to levy taxes, except by parliament. That is very clearly laid down in the bill of rights under William and Mary in 1688. Would parliament ever give authority to the British government to levy taxes on British subjects without those subjects having a right to representation ? It is always agreed that taxation without representation is something entirely contrary to the British constitution. We must bear in mind that if we ask for income tax to be imposed on us, we might have to meet, not such a small tax as we contemplate. When once we accepted that tax, we should take a step from which we could never go back and if the government next year liked to raise it to 5s. we should have nothing to say, because we should have established their right to do so. Once we admit the principle, a principle which is outside the British constitution, we admit something which might cause us endless trouble in the future."

After perusing the mass of evidence submitted before the congressional hearings on the "China Trade Act," it is refreshing to read these words from a British jurist, in explaining a principle which influenced the American colonies to declare their independence in 1776. The American people may not understand all the technical trade and other arguments for or against the "China Trade Act," but they can be depended up to grasp in a minute and demand the passage of a bill based on such principles.

It is a sad commentary on American politics that at this late date, we find the British resolutely defending the principle of "no taxation without representation," and adhering strictly to the treaties with China, while these same principles have been overlooked and ignored by Americans in the contest over a trade act, in order to compete with British companies operating on a principle their government dares not defy. There ought to be a lesson in this to the advocates of the "China Trade Act," and if the bill sticks in conference and is unduly held up, it might not be a bad idea to change the tactics and approach congress and the people of the country, on the principle involved in the British position.

The Kiangsi Railway Loan

China's Commercial Honor at Stake

THE Japanese chargé d'affairs recently dispatched a note to the Waichiaopu urging the payment of three instalments of overdue interest on the Kiangsi Railway loan, adding that unless paid by August, the creditor, the East Asia Development Company, will be obliged to take over control of the line in accordance with the terms of the loan agreement. This railway, about 80 miles long, connecting Kiukiang with Nanchang, the capital of Kiangsi province, has been in constant financial difficulty since its construction was first started. The amount owing to the Japanese company is about $2,500,000 silver, and owing to mismanagement and the other mal-practices peculiar to the operation of private Chinese railways, the company has been unable to pay the last instalments of the interest due. With the menace of foreclosure and Japanese direction, the officials of the company have been active the past year in attempting to raise funds to meet their obligations. The line itself is merely the first section of a provincial system, the concession for which is held by the company under a provincial charter, and cannot be expected to pay until extensions are built south and east from Nanchang, connecting the Yangtze with Canton, Swatow or Foochow. It was proposed last year by the president of the company that a new and larger loan be entered into with the Japanese in order to absorb the old one and provide for these extensions, but apparently, the latter are in no mood to advance further sums, under the present administration of the line and the unsettled political conditions prevailing in the province.

Unless the Chinese can raise the funds to meet this obligation, the warning of the Japanese chargé d'affairs, indicates that the creditors will, after a due period of grace, proceed to take over control. This is the only instance where a Chinese railway in operation has been mortgaged on the security of the physical properties and revenues of the lines. In all the old railway agreements, in order to eliminate the possibility of foreign control in the event of default, the Chinese allocated other revenues as security for the loans. In the Pauling and Siems Carey contracts, the line and revenues are pledged, but as these remain on paper, the issue of intervention on default of payment of interest has never before arisen. Here we have a case that will test the sincerity of the Chinese towards these matters. The onus of taking over control of a Chinese railway, with all that this implies in the minds of the Chinese towards their sovereign rights, will have to be borne by Japan, and it is to be expected that any step taken to execute the terms of the contract will be misinterpreted and the truth distorted in order to create suspicion of Japan's motives in the minds of the Chinese. The situation is, therefore, one of considerable interest to all concerned in the development of China, especially at a time when Sir Charles Addis, head of the British group in the consortium, is advocating the opening of negotiations with the provincial governments as a means of solving the present consortium deadlock. Provincial revenues, like all those pertaining to Peking, have been diverted into the pockets of the *tuchuns*. In many instances, taxes have been paid in advance for a term of years, in order to satisfy the craving of the insatiable military satraps. An example of how far the receipts from legitimate taxation have fallen off in the provinces and municipalities is seen in the publication in our February number of the budget of the city of Canton. Out of a total budget of $2,000,000, twenty-five per cent. is derived from the "sing-song" girls, and fifteen per cent. from the rickshaw coolies, a total of forty per cent. from sources that indicate in no uncertain manner, the desperate need for revenue. If this is the condition in a city which, we are assured by all competent witnesses, is a model in municipal government in China, what must be the conditions in other cities dominated by grasping military chieftains? It would seem to indicate that reliable provincial and municipal revenues that might serve as security for railway or development loans, are difficult to find.

The issue involved in the payment of the Kiangsi Railway loan is, therefore, one that should merit the close attention of foreign financial interests. The province, to all appearances, is sucked dry. It cannot come to the aid of its own railway. The central authorities are in a similar plight. Foreclosure, or foreign control of a security, has to be faced. It is the only tangible asset left to the Chinese on which they can hope to interest foreign capital in their development. If, when the time arrives to take over control on default of payment, the Chinese object, what then is left for them to offer as a guarantee of good faith?

The treaties entered into as the outcome of the Washington conference relieves China from any fear that the Japanese government or its private enterprises will harbor political designs in pressing for their just rights. The old fear of political penetration through control of railway lines cannot now be fairly advanced as a reason for the non-compliance of the loan terms. The contract rests squarely on its merits as a business proposition, and cannot be shirked by an appeal to political passions. The future of foreign investments in China is at stake on the outcome of this situation.

* * *

The Railway Aspect of the Consortium Organization for China

(Contributed)

FROM the railway point of view, realization of the consortium ideals will bring to China the following desirable changes:—

The total abolition of spheres of influence, the provision of an adequate railway system, and improved methods of operation with its corollary standardization.

These results are contingent on the assumption that the consortium terms will be accepted by the Chinese government. Until then, interest in the consortium must remain academic. At present, China shows no inclination to agree, considering her sovereignty endangered by the demand for supervised disbandment of her army, an absolute necessity for the security of any new loan.

That the sovereignty agitation is inspired, goes without saying, as disbandment means an end to the clique of military autocrats now ruling the country. There is no means of coercing these brigands, who, blind to China's interests and bent only on amassing vast private fortunes, are fast ruining the country by maintaining troops out of all proportion to the country's needs. China is perpetually on the brink of civil war as her soldiery owe allegiance only to the men who maintain them in licentious ease, men who would not hesitate to use this power for purely private ends. China is in a condition of rampant feudalism and nearing a first-class catastrophe. There must be a limit to increased taxation to support the armies, and with the new solidarity in financial matters which the consortium spells, there will be no chance for the honest broker among jealous and greedy powers such as gave Tang Shao-yi his opportunities in the first consortium negotiations of 1912-13.

In China, as elsewhere, the natural corollary to an empty treasury is mutiny, revolution and the rise of a strong man. Bankruptcy also implies more stringent foreign control of such organizations as the customs, salt gabelle, and certain railways built with foreign loans.

The hopelessness of the financial situation needs no emphasis, when it is recalled that China has recently defaulted in the matter of a comparatively small loan made by American finance. It would appear, therefore, that the consortium terms must be accepted sooner or later. These terms would embrace disbandment of the standing armies; re-union of the North and South and assignment of part of the loan to the South; supervision of loan expenditure by consortium representatives; pledging of the salt gabelle and customs to guarantee repayment.

This article pre-supposes the creation of a railway service somewhat on the lines of the customs and salt gabelle, a logical corollory of the pooling of the various national interests. The original proposals emanating from Chinese sources were for the consolidation of the capital of the various foreign-built railways into one joint loan, indicating that this idea would not be repugnant to China. In this case, everything would be centralized in Peking under one man to the lasting benefit of the country and the elimination of much unnecessary personnel from the conduct of railway affairs. If the consortium is bent on assisting China to rehabilitate herself, foreign control of the railway policy must be insisted on. Foreign direction is needed to see that there is no unnecessary railway construction and also to ensure the proper development of, and additions to, existing lines out of revenues.

At present, the vital railway needs of the country are limited to the completion of the Canton-Hankow Railway, in order to unite the North and South, prevent the recurrence of further factional disturbances and open up a district of vast industrial possibility. The Hankow-Szechuan Railway is equally important to the general welfare, for the better maintenance of law and order in the isolated province of Szechuan and for the development of that enormously wealthy province. With these two most expensive projects completed, attention should be turned to the development of a national steel industry, simply from the point of view of obtaining cheaper steel for railway construction. When it is recollected that fully thirty per cent. of the pre-war cost of railways in China was for products in which steel is the essential material and that this ratio will now be more than doubled, the importance of this development needs no urging. China should be able to produce the cheapest steel in the world. At present nearly all the ironworks in the country are either mortgaged to Japan or in Japanese hands and Japan herself needs all their output.

Lastly, from a purely humanitarian point of view, the regulation of the Huai River, and the conservation of the Grand Canal and Yellow River are of first-class importance as they constitute in their present condition a perpetual menace to the lives, property and crops of many thousands of people.

With the completion of these very urgent projects and the inauguration of an era of most rigid but wisely directed economy, it is believed that China, could, from the profits of the railways in existence, very quickly create an adequate railway system. Foreign direction, and above all, strong governmental support of that direction, are an absolute essential, unless China can produce a man worthy of consortium trust.

Spheres of influence, now happily eliminated by the Washington conference, have cost unhappy China untold millions for railways alone, for these must now be constructed at a cost vastly increased by war conditions, while the delay to education and the advent of that era of profound peace so absolutely necessary for recuperation cannot be estimated.

With regard to the question of an adequate railway system, the following figures are instructive as comparisons with other countries; the Indian figures being particularly striking as conditions and needs are somewhat similar.

The total mileage of railways of all classes, government, concession and private, is 6,836, giving for exch mile of line a population of 100,000 people and 460 sq. miles of territory. The United States has for each mile of railway 3,800 people and 12 sq. miles of territory, while India has 8,600 people and 40 sq. miles of land for each mile. Thus, to bring China up to Indian standards, China has yet to construct some 29,000 miles, a figure giving some idea of the colossal nature of the consortium undertaking and its possibilities for world trade.

The above comparisons do not, however, represent the true position *vis-à-vis* other countries, for elsewhere road construction has gone hand in hand with railway construction and with the vast development of motor traction are increasingly used as an adjunct to railways. China, however, is entirely without a road-way system and its need of railways therefore all the more urgent, from every point of view.

To the handicap of bad roads, must be added the hampering effect of many dialects, the presence of numerous *likin* or native custom stations each levying a dole fixed by the needs of the local magistrate; and the risk of pillage by banditti, ever on the increase since the revolution. The following statements will cause no astonishment. Outside the railway zones the grossest superstition still prevails which can be, and is, often worked upon to retard progression. Ignorance is appalling and abysmal, and the outlook of the country people limited by the exigences of a grinding poverty and the struggle for the barest existence. Only purely local needs are manufactured for; standards of length, coinage and capacity, vary from village to village and there may be surplus in one district and famine in the next. There is no patriotism of a large kind and village welfare is of such paramount importance as to obscure all larger issues. With no press or politics the outlook of the coolie class is limited by interests of birth, marriage, death and above all, crops. These factors in the Chinese problem need serious consideration by those who would embark on development work in China. For such, strong government backing is an absolute essential to success, as the unhappy fate of many past enterprises proves.

On the question of improved operation, the following facts are illuminating. Thus, in the board of communications' (1919) report it will be found that 16 railways are concerned with a total mileage of 3,750. For these there are 17 practically separate administrations, the Tientsin-Pukow Railway having two as the line was constructed under a joint Anglo-German loan as traversing two spheres of influence. Yet the total mileage of the whole line is 688. There are other more flagrant instances such as the Taokow-Chinghua and the Chengtai railways with mileages of 95 and 151 respectively, which obviously should rank as branch lines, were it not for loan agreements which demand independent administration, an expensive and absurd arrangement which centralization following Consortium control will eliminate. Contrast such practice with the Cape government system with 9,500 miles under the control of Johannesburg.

As regards the board of communications itself, the following reform should result as a corollory of consortium control. At present, the position of board officials and many more prominent outside railway employees, is assured only so long as their party remains in power. With a new cabinet, in all probability there will be a clean sweep of the old *régime*, a procedure not calculated to promote either efficiency or intelligent interest in the work of the board and eminently conducive to corruption. It must be remembered that an official once out of employment is, caste and face reasons aside, not often fitted for commercial life—the only prospect open to him. He must, inevitably adopt *carpe diem* tactics while in office to the exclusion of all else, for official pay of all but higher posts is totally inadequate to acquiring a competence. The present system cries for reform and the creation of a picked permanent staff in such a specialised department as the railway board induhitably essential.

Again, with regard to board railway policy, a radical change is essential. At present, the railways in operation are starved of all but vital maintenance needs and there is consequently no development of open lines, every one of which is capable of handling a vastly increased traffic, which the building of feeder lines would ensure. No single railway* in the country has yet reached the maximum capacity for single line traffic, yet no branches are built. During the year 1918, the profit on the government railways was over 33 million dollars, over 10 per cent. on the invested capital, yet the mileage added during the year was only 18. Previous years would not exceed this and although years of war, the contrast with Indian (pre-occupied with the creation of a railway system for Mesopotamia) is singularly unfavorable. During the years 1914 to 1918, the mileage of the railways of India was increased by 1678, this in a country with a well-established road system and no such crying need for better communications as China.

*The Peking-Mukden Railway is being double tracked over a length of 80 miles.

This stagnation is in no sense the fault of the board but merely a corollory of *tuchun* or militaristic government which makes insatiable demands on every source of income. Thus, in the budget for July 1919 to June 1920, totaling some 645 million dollars, military expenditure is estimated at 40 per cent. Anyone with any military knowledge or even a laymen who observed the conduct of Chinese troops in the recent factional fight between the Anfu and Chihli parties, would have no hesitation in condemning the vast majority of China's army as an undisciplined rabble, totally devoid of every quality making for military efficiency, skilled only in the gentle arts of pillage and senseless destruction, bashibazouks without the redeeming quality of a fierce courage. Rigidly supervised disbandment of these uniformed pests is a necessary preliminary to all reform and the first great work of the consortium will be to terminate this useless and wasteful swashbuckling and ensure that a non-military country, where all progress hinges on communications, is not in future disgraced by a budget which allocates one per cent. of its receipts to education and ⅜ per cent. to industrial development. In future, railway surplus must be earmarked for railway development.

To similar causes must be ascribed the rolling stock shortage which is still acute. The railways as a whole are hopelessly under-equipped when contrasted with Indian and other railways and the tonnage offering is continually on the increase. The table shows the contrast in this respect between India and China for three principal lines:

India	Wagons per kilometre	Engines per kilometre
Bengal-Nagpur	5	0.17
B.B. & C.I.	0.42	0.18
East Indian	7.8	0.57
China	**Wagons per kilometre**	**Engines per kilometre**
Tientsin-Pukow	1.26	0.103
Kin Han	1.95	0.137
Peking-Mukden	3.52	0.242

Consortium control will render impossible mismanagement of loan funds such as occurred during the construction of the Ningpo-Hangchow Railway when native companies were allowed to squander £1,500,000 of borrowed money for which the central government was liable, on the construction of a line, which, even with this aid, they were unable to complete and which had eventually to be taken over by the government and handed over to the management of the Shanghai-Nanking Railway for completion and re-construction.

Such wholesale peculation as occurred during the construction of the German section of the Tientsin-Pukow Railway should not be possible in future, together with such diversion of loan funds for industrial purposes as frequently occurred during the war, when Japan financed China without restriction for most questionable considerations. More particularly, the making of such contracts as the car purchase† agreement with Japan on behalf of the Tientsin-Pukow Railway, should, in future, be out of the question, just as much as the creation of monopolies of supply to government departments which was also attempted during the war.

Finally, the question of standardization needs emphasis. As things are at present, though such essentials as render car interchange possible on the government railways have with one exception‡ been provided for, in constructional details generally, the ideas of the country financing the enterprise have as a rule prevailed. The consequence is that each administration has its own standards, a factor tending to restrict car interchange, as repairs are not feasible away from the home line. This tendency to multiply standards has been accentuated by the recent war which made America the only possible market, and though, as a rule, efforts were made to preserve uniformity, it was difficult to fully meet the required specifications.

Standardization, though most vital in the case of rolling stock, is urgently needed in all departments and a commission of foreign experts appointed in 1919 is now advising the board of communications on this question. With the larger question of inducing conformation to standardization on the concession lines like the Chinese§ Eastern, South Manchuria and Tsingtao Railways, over which there is no government control, consortium pressure will be needed. This last is a big and vital question, as the Chinese Eastern has a gauge of 5-ft. and the South Manchuria a different height of coupling gear which entails transhipment and consequent congestion at junction points.

This indicates the railway and larger side of the work to be done by the consortium, and those who have the true interest of the country at heart will do all in their power to assist an organization whose success offers the only peaceful and permanent solution of the Chinese problem. The first essential to success depends on most rigid control of free-lance finance, which without morals, creed or country, is always ready for profitable fishing in troubled waters.

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Electrical Machinery Markets in Japan

A Promising Outlook

THE development of hydro-electric power in Japan is still in its infancy. Much has been accomplished in utilizing the natural water powers of the empire, but much more remains to be done. The business slump of 1920 brought to a sudden stop many ambitious schemes for the erection of new power plants, and further development has been checked for lack of capital. But with a return of confidence and a brighter outlook, some of the larger schemes are being revived, and we find in the island of Formosa, one of the largest hydro-electric plants in the world being financed and constructed largely by the government. The well-known American engineering firm of Stone and Webster have representatives on the ground negotiating with the Asano interests for the construction of a most important project, the details of which, as yet, have not been made public. Other large hydro-electric enterprises are waiting for the proper time to solicit new capital in order to carry out their huge plans. Amongst these is the Inawashiro Hydro-Electric Power Company, Ltd., of Tokyo, controling the water rights to a chain of lakes emptying into Lake Inawashiro and to its outlet, the Nippashi River. Seven large power houses are embraced within a comprehensive plan for the utilization of the water shed drained by the Nippashi River. Foreign manufacturers of electrical machinery and supplies should give careful study to the trend of this development in Japan, with its tendency to utilize more and more the products of home manufacture. The Japanese have made marked advances in developing their electrical industries, and despite foreign criticisms of the efficiency of their machinery, the truth stands that many important plants are now being operated with equipment made in Japan that in many respects equals the more widely known products of America, England or Germany. The day will, therefore, arrive when foreign manufacturers must face these facts and be prepared to meet Japanese competition in other parts of the Far East.

Machinery that has proved its excellence in Japan will make a strong appeal to other Asiatic people. It is for this reason that we invite special attention to the equipment of the generating plants of the important Inawashiro Hydro-Electric Power Company. The first power house, it will be noted, was equipped throughout with foreign materials; the penstocks from Thyssen & Company of Germany, the water turbines from J. M. Voith of Germany, generators and exciters from Dick, Kerr & Company (English Electric Company, Ltd.) of England, the main transformers and switchboard from the Westinghouse Electric & Manufacturing Company of Pittsburg and the traveling cranes from English makers. In the No. 2 Power House, the penstock was furnished by the Tokyo Ishikawajima Shipbuilding Co., Ltd., the water

†200 30-ton cars at $3 per car per day for 15 years.

‡C.E.R. now a Russo-Chinese Railway.

§The Chengtai Railway which is a metre gauge line—a grave economic mistake for which French engineers are responsible.

turbines by the Kobe Works of the Mitsubishi Dockyard and Engine Works, the generators exciters, switchboard and main transformers by the Shibaura Engineering Works and the overhead cranes by the Tokyo Ishikawajima Shipbuilding Works. The balance of the transmission material and station equipment seems to be about equally distributed between foreign and Japanese manufacturers. As in this instance, so in many others, Japanese-made electrical machinery is supplying the demands of the home market. The efficiency and general finish of the products will increase until they will make a strong bid for the export trade. In some cases, Japanese manufacturers are working under expert foreign supervision and control the patents for Japan of many of large foreign electrical manufacturers. The Shibaura Engineering Works turns out General Electric equipment; a new German-Japanese company, combining the Siemens and the Furukawa interests has been organized to manufacture electrical machinery in Japan under German expert supervision, and it is now reported that the American Westinghouse Company has combined with Japanese capital for the erection of a similar works in Japan.

With the great Kawasaki, Mitsubishi, Kuhara, Mitsui, Furukawa, Takata and Okura interests actively engaged in manufacturing or developing electrical machinery and devices, to say nothing of the many secondary companies, turning out material of the highest order, an intense competition must inevitably arise for the supply of domestic requirements, and with the immense resources at the command of these princely houses, it is to be expected that they will reach out for their share of other markets.

Like Sweden, Japan in time will extend her net-work of electrical power services to cover most of the requirements of her population, creating a home market of such huge dimensions that will enable her to manufacture electrical equipment at costs that must prove a serious concern to others. It is evident that Japanese capitalists are looking ahead to this development, and this possibility explains to a large extent, the desire and readiness of foreign manufacturers to co-operate with them in the establishment of large manufacturing plants.

Aside altogether from the industrial possibilities of electric power development in Japan, the growing requirements of the government railways and tramways will absorb most of the power that can be generated. Huge plans have been drafted for the application of electric power to the railway system of Japan, and as new water powers are harnessed, they will be taxed to meet the demands of industry and local transportation. There are at present over 300 minor steam railways and tramways operating in Japan that will be transformed into electric lines as power is developed.

The Japanese are rapidly organizing their electrical machinery industries to take care of thisg reat domestic demand. Nothing is too big for the manufacturer to undertake, and we find many large generating plants entirely equipped with home-made machinery operating beside others equipped with the best products of foreign factories. Efforts are being concentrated on betterments in workmanship, finish and efficiency, and under the guidance of foreign experts and the stimulus of competition a great improvement may be looked for. It is true perhaps, that during the period of the war, many Japanese manufacturers made the same mistake as manufacturers of other nations, and in the rush to obtain markets and turn out the materials quickly, much inferior rubbish was exported. However, the Japanese manufacturer was not alone in this practice, and now that he has to face the realities of normalcy and the competition of the older established foreign manufacturers, he recognizes that only the best product will win. Their products are improving and much solid progress has been made, especially in the initial work of improving their plants, bringing them up to date with the addition of the best types of machinery. Japan's present problem is the lowering of costs of production, and a general readjustment of wages and living conditions in order to permit its products to successfully compete with other nations. As things stand at the present moment, with the balance of trade heavily against them, the Japanese manufacturer must first face the problem of reducing costs in order to hold his own market. Under the careful and wise guidance of the governor of the Bank of Japan and other high authorities, much progress is being made towards this end, but there is still much to do before prices can be brought down to a level where home products can successfully hold the home market against the flood of competition from better organized and equipped foreign manufacturers. However, it may be accepted that the present situation is only a temporary one, and as the electrical machinery plants are re-equipped with the latest machinery, the expansion of their home market will enable them to reach a basis of quantity production that must materially lower costs and permit them to compete more successfully for the export trade.

Amongst the more important manufacturers of electric equipment in Japan are the following concerns :—

	Established		No. of Workmen	Capital 000's Yen
Shibaura Works, Tokyo ..	June	1894	2,787	5,000
Hidachi do.	July	1911	1,481	
Okumura do.	Jan.	1895	818	10,000
Mitsubishi Shipyard Electrical Dept.	Nov.	1919	1,652	
Kawakita Works	Apl.	1913	750	6,000
Osaka Electric Light Co. Elec. Machine Dept.	Oct.	1897	597	
Osaka Elec. Machine Mfg. Co.	Dec.	1911	253	5,000
Yasukawa Works	Jan.	1917	410	250

Manufacture of telephones and telegraphic machinery and electric lamps :

Japan Electric Co.	July	1889	743	5,000
Oki do.	Aug.	1911	613	2,500
Tokyo do.	Feb.	1912	2,720	6,000
Osaka Electric Co. Lamp ..	Feb.	1907	448	1,000

There are many other smaller manufacturers of lamps and accessories, whose products found only on the home market, cut no figure in the export trade, and who, in the fierce competition with the larger firms are destined to be absorbed. The existing companies have already developed a considerable market for their products in other Asiatic countries especially in China and India. Manchuria and Eastern Siberia are to a large extent part of the home market, but the Japanese have to fight hard to obtain the more important orders not controlled by their own nationals. According to figures recently compiled by the department of agriculture and commerce of Japan, the export of electrical machinery of all kinds in 1914-15 was valued at only Y. 500,000. This was doubled in 1916. In this period, the export of telephone apparatus has increased in value from the negligible sum of Y.16,000, to almost a million, although succeeding years record a falling off.

The following table shows the increase in exports, China and India being the chief buyers (in 1920 for ten months only) :—

Year.	General Electric Machines and Parts Thereof.	Telephone Apparatus and Parts Thereof.
	Yen.	Yen.
1914	450,127	16,320
1915	582,075	48,784
1916	1,446,923	896,143
1917	2,493,000	429,000
1918	3,984,000	420,000
1919	4,443,000	630,000
1920 to Oct. ..	3,983,141	597,380

Import generally fell off in 1915, but began to revive in 1917, lasting until 1920. There was a large increase in 1919 and 1920, in such goods as motors, transformers and dynamos. The follow-

ing table gives the value of the import trade (in 1920 for ten months only) :—

(Values in Yen)

Year.	Dynamos & Motors.	Dynamos coupled with Motor Machinery.	Telegraphic and Telephone Apparatus and parts thereof.
1914	2,407,634	435,470	716,168
1915	501,406	248,129	49,171
1916	391,958	441,897	59,860
1917	1,129,000	583,000	61,000
1918	3,061,000	485,000	91,000
1919	5,245,000	736,000	265,000
1920	4,558,975	588,488	530,529

An analysis of this trade shows the distribution of the imports between 1914 and 1919 (000's omitted) :—

	1914.	1915.	1916.
Dynamos and Motors :			
America..	1,069,312	327,170	219,836
	1917.	1918.	1919.
	1,076	2,975	4,763
	1914.	1915.	1916.
England..	401,050	130,574	95,483
	1917.	1918.	1919.
	49	36	187
	1914.	1915.	1916.
Germany	786,988	22,377	17,533
	1917.	1918.	1919.
	0	1	0
Dynamos Coupled with Motive Machinery :			
	1914.	1915.	1916.
America..	14,321	62,921	247,320
	1917.	1918.	1919.
	490,000	483,000	431,700
	1914.	1915.	1916.
England	265,575	186,208	145,649
	1917.	1918.	1919.
	43,000	0	0
	1914.	1915.	1916.
Sweden	0	0	0
	1917.	1918.	1919.
	49,000	0	199,000
Telegraphic and Telephone Apparatus :			
	1914.	1915.	1916.
America..	20,386	14,327	26,598
	1917.	1918.	1919.
	50,000	74,000	247,000
	1914.	1915.	1916.
England	40,463	28,636	28,559
	1917.	1918.	1919.
	6,000	1,000	5,000

* * *

Who's Crazy Now?

SOME time in 1913, Dr. Sun Yat-sen made public his ideas on issuing paper currency based on the value of merchandise and the necessities of life stored in government warehouses. His friends and enemies alike immediately said he was crazy and whilom advisers seized this opportunity to justify their betrayal of his cause and solidify themselves with the Peking mandarinate. Since then, whenever the occasion arises, these defamers of Dr. Sun, invariably refer to his currency plan as proof positive of an unsound mind.

Well! there appears to be others. No less a lunatic than Thomas A. Edison has sent out a questionnaire to bankers and economists for opinions on a variety of subjects, the most important of which was whether national resources were not a good basis for federal currency. His first question was: "What, in your opinion, would be the approximate market value of a Troy ounce of pure gold if all the governments in the world should demonitize it." e also sought information as to why currency on a basis of fifty per cent. of the value of necessities of life stored in government warehouses would not be sound money, and why the equity retained in the warehouses should not be discounted at commercial banks. If such issues of money are unsound, the inventor asks that the bankers enlighten him why. Phew! Sun Yat-sen all over again. The old inventor who thinks with his head instead of with his feet, has the nerve to put it up to the economists and bankers and requests them to answer.

According to the "Christian Science Monitor" "this perfectly simple inquiry seems to arouse the editorial minds of certain papers to a fine frenzy. Instead of answering the question with facts they resort to abuse. They even refuse to discuss it, expressing wonder that the money question queers the soundest practical minds from Benjamin Franklin to Peter Cooper and from Cooper to Edison and Henry Ford." They apparently overlooked Dr. Sun Yat-sen who seems to be in very good company; in fact, the company of the most practical men the world has produced.

It will be interesting to read the answers of the leading bankers and economists to Mr. Edison's questions. Coming from him it would seem that such questions are eminently pertinent and should be treated with respect.

Japanese Patent Law

Changes have recently been made in the patent law of Japan which will probably improve the value of Japanese patents and facilitate the obtaining of effective grants. Although Japan has been a favorite country with patentees, yet for a number of years the procedure and results have appeared in the eyes of many to have been very unsatisfactory. Applications have been rejected on grounds which did not appear adequate or the patents allowed did not seem to cover all that the inventor felt that he was entitled to protect.

The new laws were put into force at the beginning of this year, but it is desirable for those having applications at present on file to be aware of the fact that it is generally understood that the new procedure under the recent law will not apply to them. Japan being a party to the international convention, one year is permitted from the date of filling a foreign specification to enable an application to be lodged in Japan. It seems that a patent is to be granted for any given invention to whoever applies first independently of any alleged priority, say of manufacture. The foreign inventor should therefore definitely file his application under the provisions of the international convention, claiming his foreign date which will be effective, and not risk relying on the Japanese date.

Apparently, a single patent under certain circumstances may cover both process and apparatus, but substances made by chemical processes are not patentable. The examiner will make a search as heretofore, but provisions are made for dealing with the examiner's objections, and it is thought that the new arrangements will result in less delay than has been heretofore experienced in the prosecution of Japanese applications. The examiner will not be empowered to reject a case definitely until the applicant has been able to deal with his criticisms. An opposition period after publication of the specification is now to be allowed on the lines of British practice, namely, within two months of the date of publication in the official gazette, and it appears that the examiner shall decide finally on the matter not only on the grounds found in his investigation, but by the result of his study of the opposition.

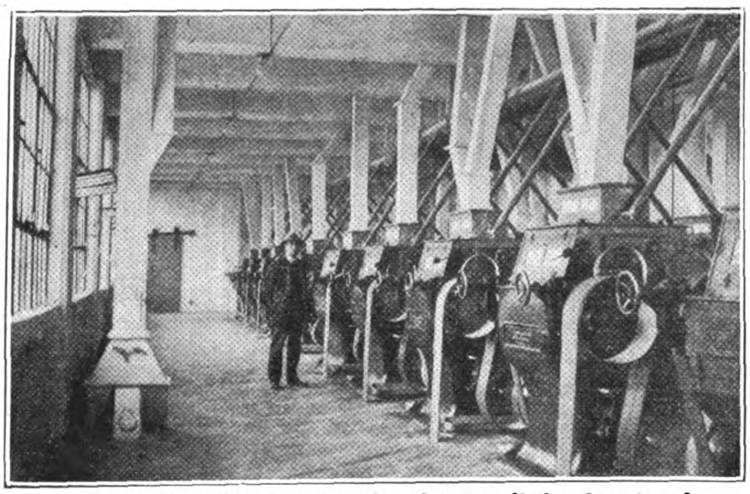
Re-examination of the application of rejection by the examiner is modified in the new law, and apparently a kind of hearing or trial is substituted with the rejecting examiner a defending party. The case is at this stage considered by a group of several examiners, and it is thought by those in Japan that this course will give much better protection to the inventor than the former system. Among the other provisions there may be noted that working requirements are still made, and there are sections dealing with the grant of compulsory licences. The Japanese patent term is fifteen years dating from the date of publication, and all patented articles must be marked, or no damages can be claimed for infringement.

A Three Thousand Barrel Allis-Chalmers Flour Mill in Shanghai

Progressive Chinese Milling Firm Completes a New Plant, The Fourteenth in its Chain of Mills

Editorial Note.—Newspapers in the United States are commenting on the fact that for the first time in history, flour milled in China is being sold in the markets of Europe. Heretofore, the Chinese have been great buyers of American flour, but recently conditions have changed and the Chinese mills are exporting it in large quantities. There are great stretches of land in China suitable for raising wheat, with labor at a very low level. The following article from the *American Miller* on the great Fou Sing flour milling enterprises in China indicates the great advances that have been made by one company in developing its business until now it has a large export trade reaching to Australia and Europe, where its products compete successfully on their merits with the more widely known American, Canadian and Japanese brands.

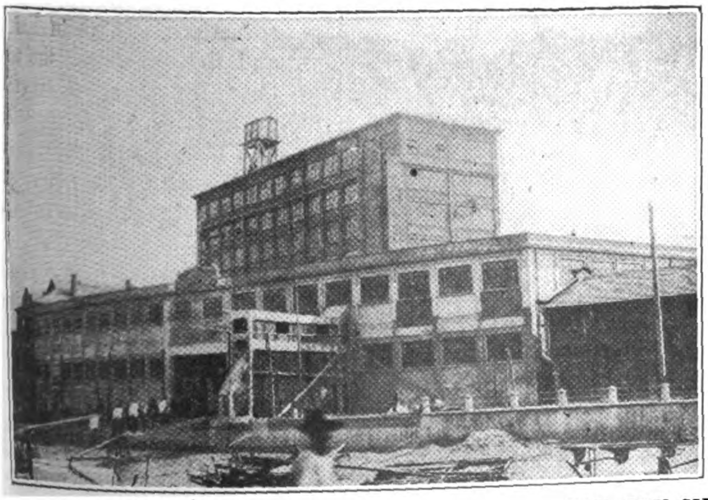
THE opinion prevails in America that milling is a comparatively new industry in China dating from the introduction of English and American machinery and milling plants in that country. Nothing could be farther from the truth, for Chinese milling is a very old art, and the milling craft ranks high among Chinese castes. To be sure, the Chinese never have been great bread eaters, but the alimentary pastes, such as noodles and macaroni were principal articles of diet long before Columbus set out for America from Spain.

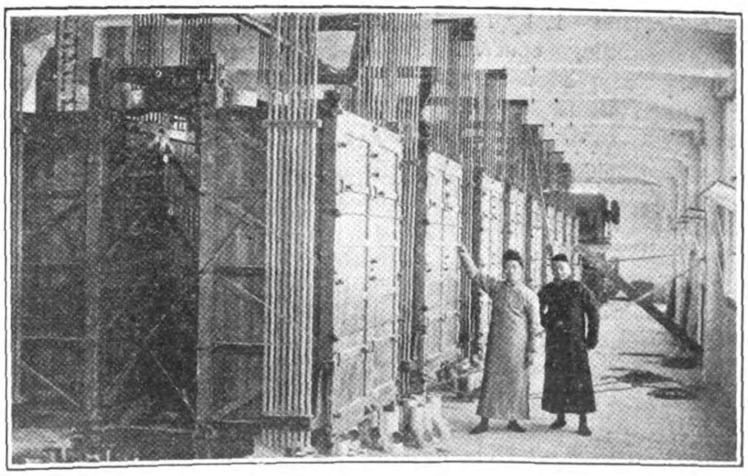


The Fou Sing Mill, No. 7, at Shanghai, installed and equipped throughout with Allis-Chalmers Flour Mill Machinery, sold through the American Trading Co.

We think of the Chinese as a rice-eating people, and it is true that rice is the chief cereal food of three-fourths of the people. The southern part of China is warm and with abundant rainfall, the soil is rich, and the farmers have handed down their knowledge of agriculture from generation to generation for hundreds, even thousands, of years. They do not know much about scientific agriculture—as a science, but they have found out by experience and practice as a regular thing many of the principles which we regard as new science. Among these practices are crop rotation, fertilization, the use of legumes for supplying nitrogen to the soil, summer fallow, etc. Practically every vegetable, grain and fruit which we are familar with in America is grown in China, and many others besides. In southern China from two to six crops are raised from the same land each year. Most of the farmers are tenants and pay their rent with a large share of their rice crop, but many farmers own their land and are prosperous.

But it must be remembered that China, including Manchuria and Thibet, is considerably larger than the United States, being 2,400 miles from north to south and about 3,000 miles broad. Its climate shows even greater variety than ours for the extremes of temperature between summer and winter are more marked. In the central and northern portions conditions closely resemble our grain belt. The soil is largely alluvial, the great rivers bringing down vast quantities of fertile soil each year, much of it being the fine dust which blows for hundreds of miles from the Gobi Desert. Wheat is raised in great quantities and in marked varieties. For instance, Manchuria grows a macaroni wheat of great strength but of poor color for flour; Northern China, or the provinces of Shantung, Szechuan and Honan, grows a white wheat similar to

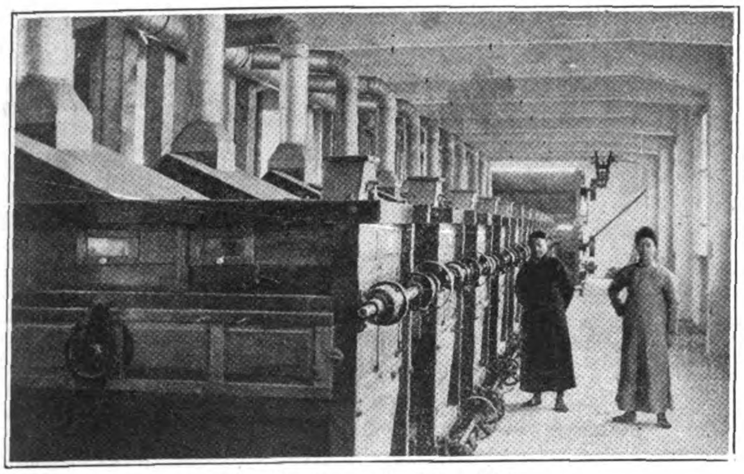




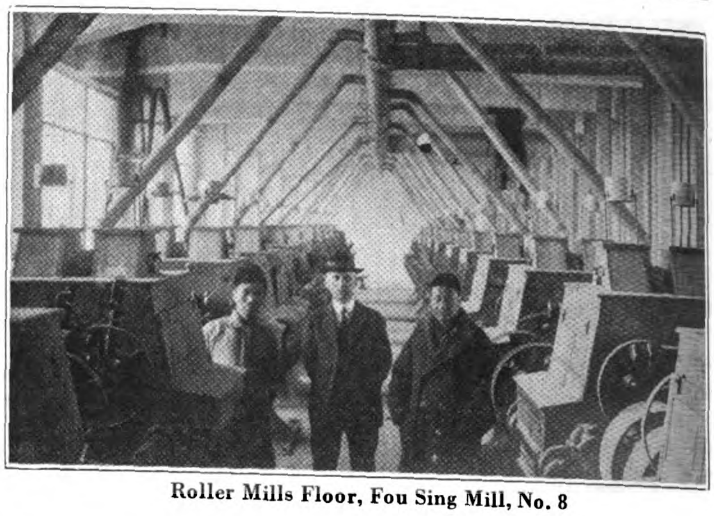
THE FOU SING MILL, No. 7

Grinding Floor

Sifter Floor



Purifier Floor, Fou Sing Mill



Roller Mills Floor, Fou Sing Mill, No. 8

the Walla Walla, but softer, which is good in strength and excellent color, light in bran and clean and free from impurities. In the central province of Hunan is grown a large red winter wheat called " Hankow" of good strength and fair color, but heavy in bran. In the Yangtze Valley in the provinces of Chinkiang and Kiangse a variety is grown which is called Wusih wheat. It has a small light red berry, fair strength, good color, light bran, and is regarded as the best all-round wheat in China. Wah-Yo wheat is grown in Anhwei province. It is a transparent wheat sprinkled with white berries, very strong in gluten, fair color, fairly clean and light in bran. South of Shanghai there is grown a soft red wheat of good color but very low in gluten.

In the March issue of the *American Miller*, Mr. Sanborn states that Chinese wheat contains gravel or stone, giving the impression that all Chinese wheat comes to mill in that condition. Mr. Akerman, milling superintendent for the Foh Sing Mill at Shanghai, write that this impression is erroneous, for a certain variety of Hankow wheat only, contains stone and has to be specially washed on this account, all other Chinese wheats being quite free from stone of any kind. Mr. Akerman also states that wheat is plentiful and has improved wonderfully in recent years, and that China will soon have to be reckoned with as a flour exporting country.

Now, Mr. Akerman ought to know, for he not only is of milling stock, his father and grandfather being millers, but he went to China in 1899 as assistant miller in the first modern flour mill built in Shanghai. He installed several mills in China and ran them for over 14 years. Then, in 1917, he joined the British army and served in France for two years, rising to the rank of captain. While still in France, Mr. Akerman's services were secured by the Mow Sing & Foh Sing Flour Mills to serve as superintendent of mills Nos. 1, 3, 6 and 7 at Shanghai, The Foh Sing Mill No. 7, which has been completed being the largest mill in China at the present time.

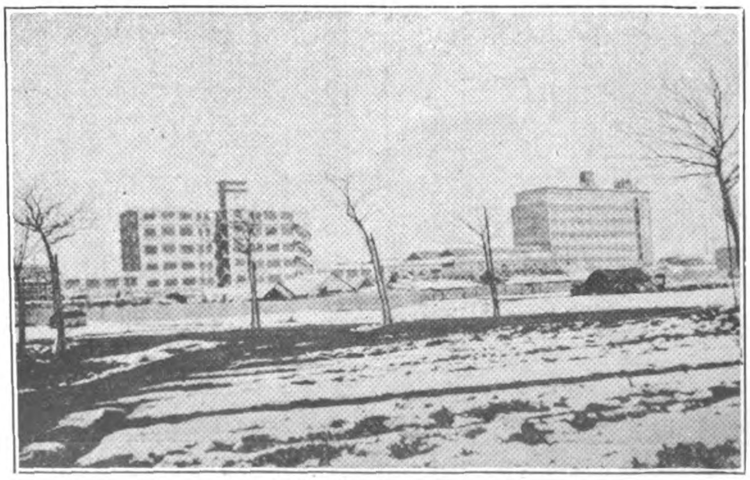
The Mow Sing & Foh Sing Mills Company is by far the largest milling concern in China. They have 14 mills, of which, three are leased. Seven of the mills are at Shanghai. No. 1 is of 400 barrels' capacity; No. 2, 3,000 barrels; No. 3, 1,200 barrels; No. 4, 1,200; No. 5 (now known as No. 8), 1,500 barrels with machinery ordered to double the capacity; No. 6, 1,200 barrels; No. 7, 3,000; and the Yuen Fong Mill (leased) 300 barrels. At Hankow a 1,500-barrel mill; at Wusih two mills of 500 barrels each, the Pao Sing Mill (leased) 400 barrels, and the Tar Loung Mill (leased) 300 barrels; and at Tsinanfu, one mill of 600 barrels. This makes a total capacity of 15,600 barrels of flour per day. And this, remember, is China, the rice-eating country.

The company was founded and is now managed by T. K. Yung, who is known as the Flour King of China, and one of the most highly respected and progressive business men of that country. W. C. Wong is manager of Foh Sing Nos. 1, 3, 6 and 7 mills. He is a keen business man, alert and progressive and deserved much of the credit for the successful development of the mills under his care. He works in close harmony with Mr. Akerman and together they make a strong combination.

The Foh Sing Mill No. 7 was designed by the Allis-Chalmers Manufacturing Company and the complete equipment was furnished by that firm through its agents, the American Trading Company of Shanghai, China. The mill was built, however, by Chinese contractors and the machinery was installed by native millwrights under the supervision of Mr. Akerman.

The plant is eight stories high and is of reinforced concrete construction with wooden floors. The general layout of the plant includes elevator heads, 22 universal dividers for dividing stock to the sifters, and 12 perfection dust collectors, taking care of the dust from all purifers and elevator suction trunks on the eighth floor. On the seventh floor are 16 No. 1070A Allis sifters, with eight centrifugal reels and nine purifiers. The sixth floor has nine purifiers, eight centrifugal reels, six rebolting reels, four bran dusters, and four short dusters.

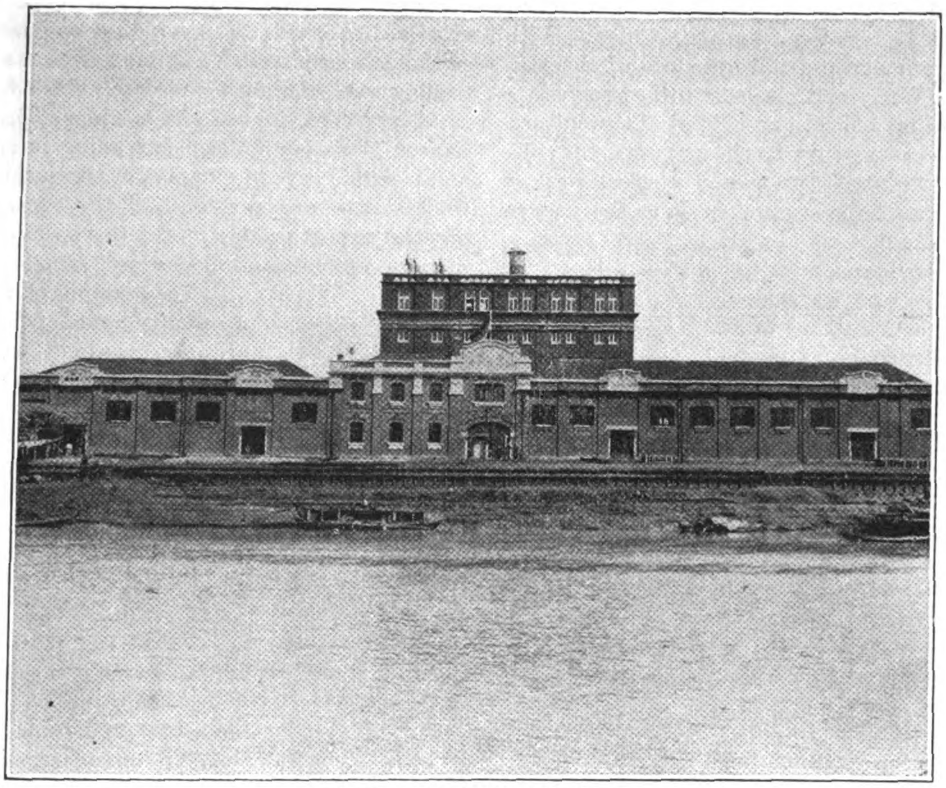
The fifth floor is a maze of spouting with little else except fans and dust collectors for the roll suction. On the fourth floor are 22 double stands of 9 by 36 rolls and 27 double stands of 9 by 300 rolls, all of the style A, Allis types. Fifteen stands are used on breaks and 34 stands on reductions. The main shafting and drivers are on the third floor together with flour packer bins.



Fou Sing Mills, Nos. 2 and 8, at Shanghai

The second floor is of reinforced concrete, the only floor of this kind in the mill. There are 12 reliance flour packers, elevator boots and an 18-inch belt conveyor running the whole length of the packer row and extending into the warehouse for conveying flour from the packer floor. A portion of this floor is partitioned off and contains roll corrugating and grinding machinery, so that the rolls can be kept

in perfect condition at all times without taking them outside the building. This provision, of course, is not necessary in American mills for here are plenty of well-equipped roll-grinding and corrugating plants convenient to all mills, but in China machine shops are not available everywhere and transportation is so poor that costly delays might be encountered. The first or ground floor of the mill has three reliance bran packers, storage bins for bran made during the night shift and the wood and tin shops. According to Mr. Akerman, Chinese mills either work full time or shut down entirely, and "when working would work Sundays, high-days, holidays and every other kind of days if the miller would stand for it." So there is need for these bran bins so that all bran can be packed in daylight.

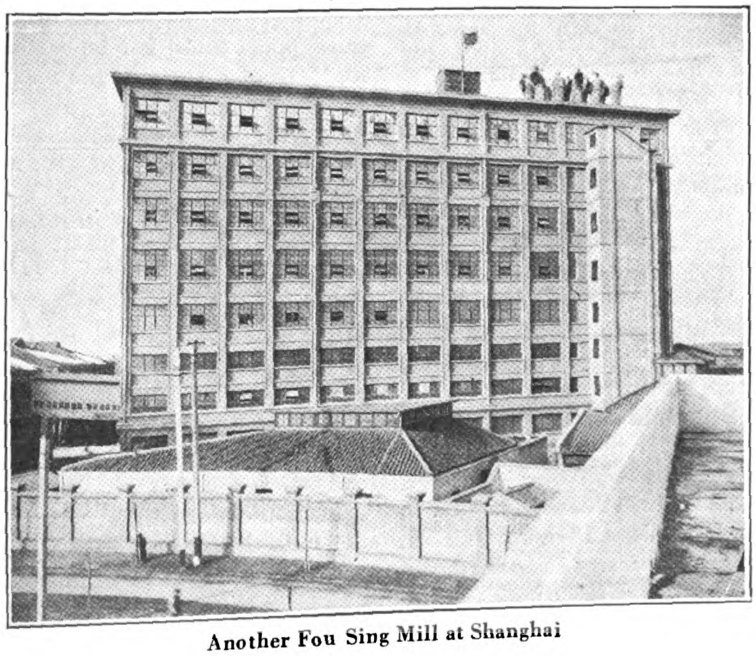


The Fou Sing Mill at Hankow

The cleaning department of the mill is in a separate part of the building and is included on all eight floors. On the eighth floor of this department are cyclone dust collectors, dust room, elevator heads and dampening conveyor. The seventh floor has a large double receiving separator, which, with the elevator, is driven with a separate 50 horse-power motor; two first milling separators; two rolling screens; and two iron prince scourers.

On the sixth floor are two large eureka scourers and a second milling separator. Four eureka cockle machines, each of six cylinders, and one second milling separator are on the fifth floor. The fourth floor has three iron prince scourers and four eureka brush machines.

The third floor is taken up with shafting, elevator boots, etc., and the second floor with bagging off spouts. On the ground floor are the conveyors from bins, elevator boots, and the main shaft drive and belts in a closed off room. As will be noted from the cleaning flow, reproduced above, the cleaning process is remarkable for its thoroughness.



Another Fou Sing Mill at Shanghai

The mill is driven entirely by electricity. The motor room is built on the end of the cleaning department and is of reinforced concrete construction. It is equipped with one 1,200 horse-power Allis motor, transmitting power to an 8½-inch shaft carrying two 60-inch belts which comprise the main drives of the mill.

The mill is completely equipped with a sprinkler system, supplied from a 9,000-gallon tank built on the roof, and also connected with a 750-gallon per minute underwriters pump, driven by a 75 horse-power-motor. There is also a 35-gallon supply pump with an air compressor attached for supplying air pressure to the sprinkler system.

In the warehouse a preliminary wheat cleaning plant is being installed with an 80-inch belt conveyor for carrying wheat to the cleaning department. A complete system of portable conveyors and stackers is also being installed for receiving wheat and discharging products into boots. At present this is all done by coolie labor, the men carrying four bags of flour or two bags of bran which weigh two piculs, or 266¾ pounds. This labor is all piece work and the coolies sometimes earn as much as $1 (Mex.) per day, equal to 50 cents in gold. This is a very good wage for this class of labor in China, but it remains to be seen if the mechanical conveyors can do the work more economically.

The mill storage consists of three brick warehouses for the storage of wheat in bags with a combined capacity of about 300,000 bushels, and two reinforced concrete warehouses for the storage of flour with a capacity of 500,000 bags. In the mill itself, the milling bins have a capacity of 40,000 bushels and the tempering bins will hold 5,000 bushels.

The plant was started up in October of last year and has been running day and night ever since, and has given perfect satisfaction in its results. The average day's run for the mill is 12,000 50-pound sacks of the different grades divided as follows: 5 per cent. patent: 70 per cent. bakers; 18 per cent. clear low grade; and 7 per cent. red dog. The patents are sometimes turned into bakers and a straight grade made. A recent analysis of the straight flour showed: Moisture, 12.01; ash, .485; gluten, 9.72. Color and elasticity of gluten, good; color of flour, good.

The distribution of the flour is interesting. The patents go to local foreign bakers to supply the need of the foreign population at Shanghai. The straights and bakers go to export, and the low grade and red dog to Chinese consumers.

Chinese mills have done a large export business recently for the wheat control measures in Australia have put the Austr-

(*Continued on next page.*)

The Second Kwangtung Agricultural Exhibit

Openings for Farming Implements

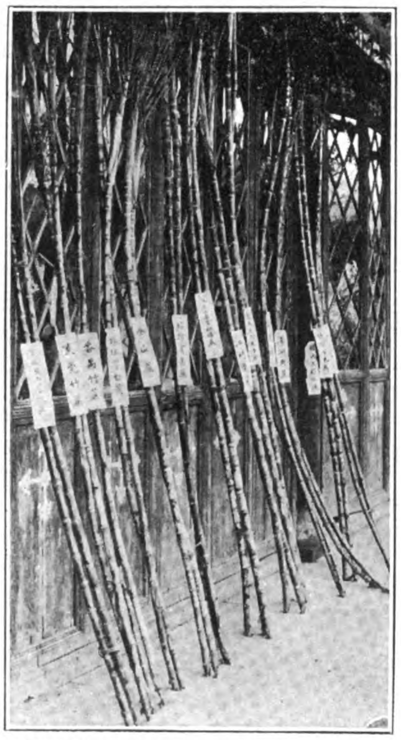
By C. O. Levine

THE second agricultural exhibit of Kwangtung province was held on March 1st to the 10th at the provincial agricultural and forestry experiment station, Canton, China. With the united efforts of the government agricultural station, the College of Agriculture of Canton Christian College, and the progressive governor of the province and his officials, an exhibit of agricultural products was prepared that was a credit to the province, in spite of the fact that the seamen's strike prevented a great deal of material for exhibiton purposes from coming in from the various districts of the delta region.

The exhibit was originally planned for seven days. However, because of the interest shown and its evident educational value, it was extended to ten days. Each day some 15,000 people came to view the exhibits and demonstrations.

The expense of the exhibit was met by government appropriation. The admission was free, so that it was possible for every farmer in the vicinity of Canton to get the benefit of the exhibit. Although it was held at a busy season of the year it was pleasing to note that a large part the attendance was composed of farmers from surrounding villages.

Among the many exhibits those of sericulture, entomology, forestry, cotton, vegetables, citrus fruits, canning, farm machinery, swine, dairy and poultry were of special interest. In the dairy, poultry and swine exhibits were representatives of the shipment of animals from America just received at Canton Christian College. This shipment included Holstein Fresian cattle, Toggenburg milch goats, Berkshire pigs, Barred Plymouth Rock and White Leghorn chickens. All of this stock is of unusually fine breeding, and the animals shown were a valuable addition to the exhibit.



Varieties of Sugar Cane, grown in Kwangtung Province

A Babcock demonstration was made every afternoon to show how buffalo milk compares in fat with European cow's milk. Buffalo cows, which are by far the most common cattle in Kwangtung, give very little milk, but the milk is very rich and nourishing. It contains three and one-half times as much fat as European cow's milk, or about 11.25 per cent. Hence, it especially valuable for cream or butter. It is very palatable although some find it too rich because of its high fat content.

One point in favor of buffalo milk is the fact that buffalos are free from tuberculosis, that dreaded disease common in European dairy cows as well as in the human family. No case of tuberculosis in buffalo cows anywhere in the world has ever been known.

The machinery exhibit, mostly Chinese, American and Japanese, was of unusual interest, and drew a large crowd of interested folks at all hours of the day. The machinery from abroad included plows, harrows, hand seeders, cream separator, churn, cotton gin, pumps and spraying outfits. The large American grain drills, steam plows, and threshers are at present far beyond the farming conditions of most parts of China, but the modern wheel hoe and planter or one-horse (one-cow) machinery will before long be in demand by the more progressive farmers of this and other provinces. In small, simple and inexpensive modern machinery they have part of the solution of the problem of meeting the slow but steady rise in cost of labor.

A part of the sericulture exhibit was a demonstration prepared by the government agricultural experiment station showing improved methods of unwinding cocoons and reeling silk. This exhibit also contained a demonstration showing methods of controlling and eliminating disease, which frequently cause as much as 90 per cent. loss of silk worms. The College of Agriculture of Canton Christian College is leading in silk worm disease control and is selling eggs to villagers in which the disease has been reduced to less than one per cent. of the eggs. Since silk is by far the greatest export product of Southern China, this work of introducing modern methods and disease control is of extreme importance.

The exhibit of fruits and vegetables was unusually large, and showed that the Cantonese are not content with their own scores of varieties of valuable fruits, but are going to America and other countries for horticulture specimens which will add to the large varieties already represented in that locality. Some of the recent introductions are: cauliflower, tomatoes, head lettuce, lima beans, sweet corn; and among fruit trees, the American peach, plum, grape fruit, oranges and other pome and citrus fruits. The horticulture and agronomy section of the exhibit included more than two thousand different entries.

During the exhibit, a test was conducted by the experiment station showing the percentage of sugar in different varieties of locally grown sugar cane. A native press, with decided improvements, was used for this purpose.

The exhibit included material sent in from forty different districts of the provinces, thirty schools, as well as many entries by individuals and business firms.

The Kwangtung agricultural exhibit was initiated in 1916 by Mr. Chu Ching-lan, then the civil governor of the province. It was originally planned to make the exhibit an annual event, but due to political disturbances these plans could not be carried out. Plans are now being made for a similar though more extensive Exhibit in 1922.

A Three Thousand Barrel Allis-Chalmers Flour Mill in Shanghai

(*Continued from page 305*)

alian mills out of the competition, and as a consequence, China has had less competition than formerly. Japanese, Canadian and American flour are all competitors, however. But this new Foh Sing Mill can meet any of them on an even basis for the equipment and operation of the mill are of the most modern types and economies are looked after as carefully as in the best regulated American plants. The Chinese milling company is certainly to be congratulated on its mill and the progressive policy it has assumed, and can look forward to a most successful career.

Egg Products in China

A JAPANESE official estimate in 1919 places the total number of hens in Shantung at 1,500,000 and estimates the annual production of eggs in that province at 126,000,000, or 84 eggs per hen. The exports of eggs originating in the province, including fresh, preserved and manufactured eggs, totaled 91,684,611 in 1913, a normal year. On this basis of 73 per cent. of production exported, the production for all China in 1917 was estimated as follows :

Exports of yolk (29 per cent. of the total weight of egg albumen and yolk exported in 1917, 53,502,500 pounds), 15,515,725 pounds, equivalent on the basis of 50 eggs to the pound of yolk to	775,786,250
Total exports of frozen eggs (4,756,100 pounds) and estimated weight of shell (475,610 pounds), 5,231,710 pounds, equivalent on the basis of 10 eggs to the pound to	52,317,000
Total number of whole eggs, fresh and preserved, exported	247,400,000
Total exports	1,075,503,350
Total annual production	1,473,292,250

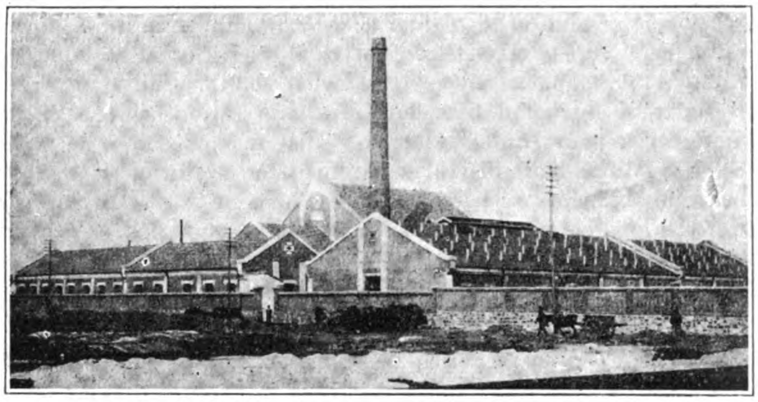
Customs figures, says a recent bulletin of the bureau of economic information, prove the industry to be of considerable importance in China's trade to-day. The following export figures give an idea of the progress registered since 1912 :—

Date	*Piculs*	*Haikwan Taels*
1912	125,167	1,984,578
1913	155,973	2,943,956
1914	132,158	2,870,087
1915	199,967	4,864,925
1916	288,346	7,702,403
1917	495,019	11,999,684
1918	289,357	9,307,227
1919	606,182	19,825,098
1920	423,203	11,928,143

The Haikwan Tael has risen in value from 3s. *or* $0.74 *gold in* 1912 *to* 6s. 9½d. *or* $1.24 *gold in* 1920.

The chief egg-producing districts in China are the provinces bordering the Yangtze and Yellow Rivers, with Hankow, Kiukiang, Wuhu, Nanking and Chinkiang as the centres. Shantung also maintains a thriving industry, computed by a Japanese estimate to deal in 126,000,000 eggs yearly, 75 per cent. of which is exported. These are the principal areas engaged in poultry rearing, but as a matter of fact the trade is general throughout the country, and almost every farmer makes it one of his side-lines. The eggs are sold to collectors who travel throughout the provinces for this purpose.

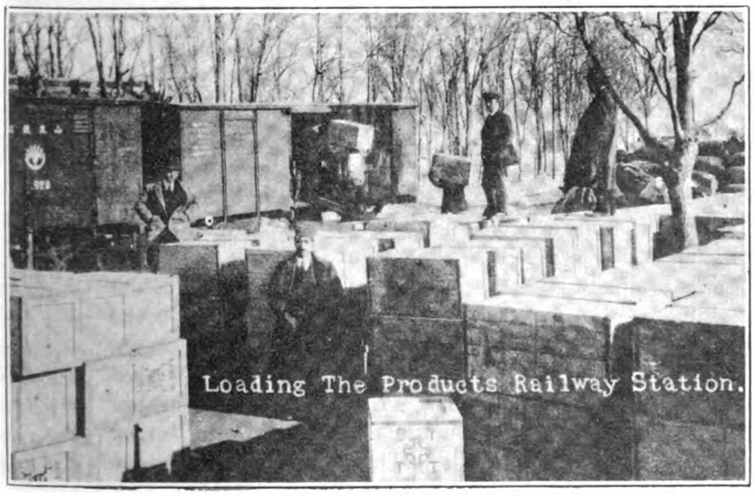
Egg products as an industry came into prominence before the Sino-Japanese war of 1895. At this time the Germans were the promoters of various undertakings in the Yangtze valley and maintained a first position till the European war. Then the Americans began to take a lively interest in the business, and at the present time nearly four per cent. of the American imports from China are dried and frozen eggs. An investigation conducted in 1920 revealed the fact that there were nine American egg factories in China, this figure being the highest for foreign ownership. In



The Toa Egg Drying Co., Ltd. Works at Tsinanfu, Shantung

addition, the Americans claim seventeen of the principal exporters of egg products from China, the next position being held by Great Britain with ten. Nowadays, however, the Chinese are displaying extreme activity in controlling the trade. Egg product factories are springing up everywhere, and, although the majority are far from modern in their equipment, the interest that is evident throughout the country is calculated to intensify the present abnormal development.

Thus it may be anticipated that the exports of eggs from China will not maintain themselves at 1919's high figure. The egg product factories are diverting more and more eggs formerly destined for foreign countries into their own manufactures. It will be a question whether a more extended egg production can keep even the present margin for exports.



Manufacture of Egg Products

The process of manufacturing the principal egg products (whole-egg powder, dried albumen, liquid yolk and dried yolk) is briefly as follows: After thorough cleansing the eggs are broken, and for individual manufacture of albumen and yolk the two are separated. After two or three days of fermentation, during which time the clear liquid settles and is drawn off, the high acidity of the albumen is neutralized by the addition of ammonia. The drying is then done in shallow metal pans, coated with vaseline, in rooms heated to a temperature of 140° F. The dried albumen is put up in tins of 100 pounds net each; these tins are packed two to the wooden box, which weighs 250 pounds gross and measures 7 cubic feet.

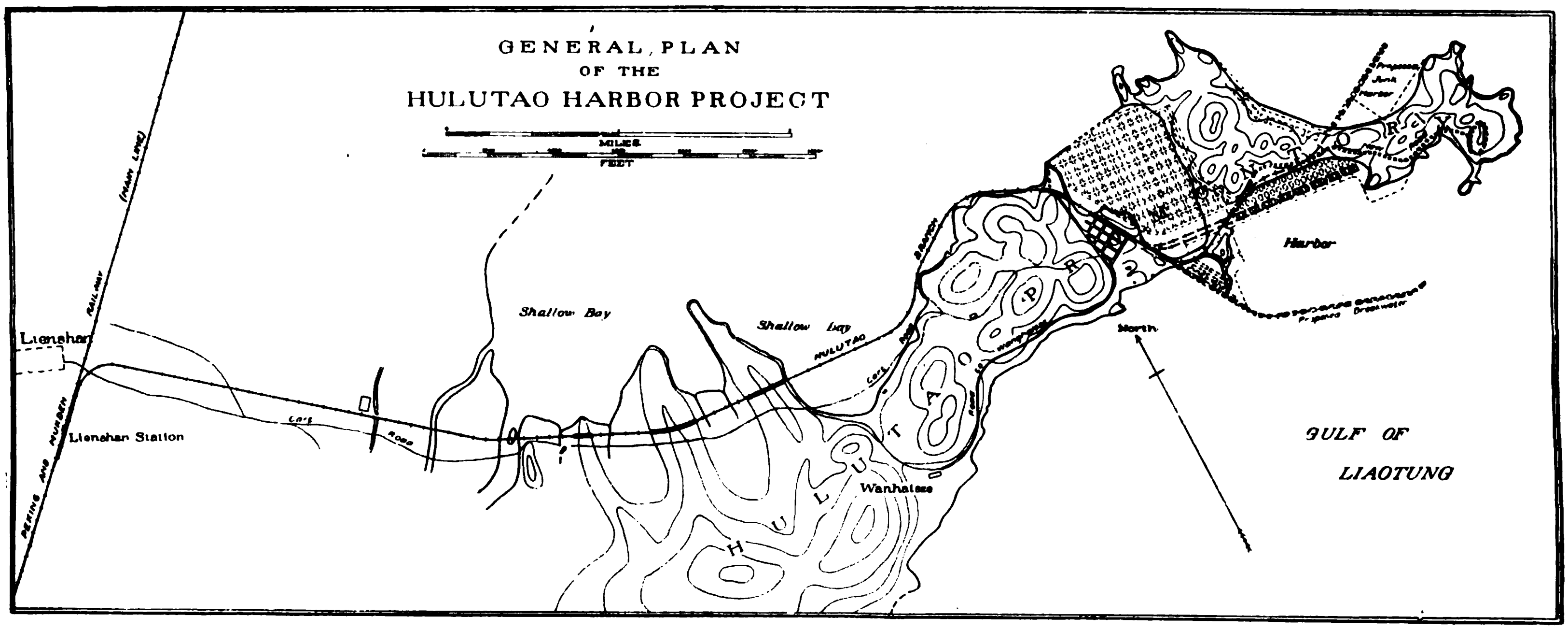
Liquid egg yolk is run through a series of graduated sieves so constructed as to leave the final product in practically liquid form which is treated with either a 2 per cent. solution of boracic acid or a 1 per cent. boracic acid and 9 per cent. salt solution, or sometimes a straight 12 per cent. salt solution, after which the yolk is mixed in wooden drums for 15 minutes. It is shipped in barrels weighing 500 pounds gross and 430 pounds net and measuring 12 to 14 cubic feet. Some factories guarantee the yolk to keep four months from date of shipment.

Dried yolk contains no chemicals and is manufactured by vacuum machines, about 51 yolks being required to a pound of powder.

The Hulutao Harbor Project

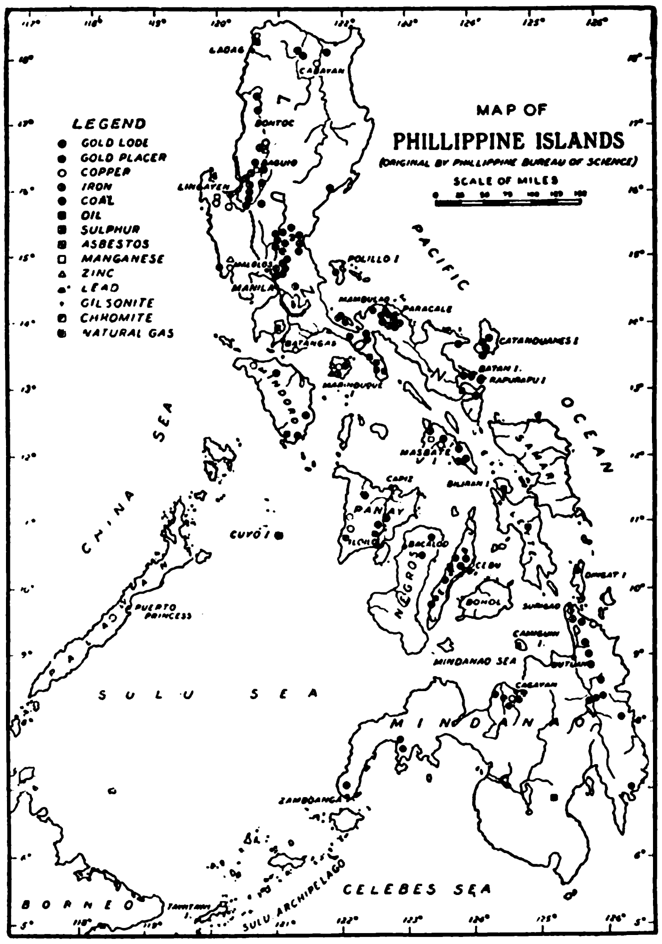
From the Customs Reports

WORK was commenced at the end of October, 1910, and suspended on the 25th October in the following year. In this relatively brief period a standard gauge railway laid with 60-lb. rails was constructed between Lienshan station, on the Peking-Mukden Railway, and Hulutao, a distance of some 7½ miles; for about one-half of this distance the railway is laid on rock embankments or passes through deep cuttings. A cart road over the hills between these points was also completed. A seawall along the shore running parallel to the coast-line at low-water mark was constructed as a protection for the end of the railway line as it nears the breakwater approach, with which it is practically a continuation, as it makes a final connection between it and the base of the rocks forming the mainland. This wall was founded on concrete blocks built into place on the solid rock at low-water level. The blocks are each 30 feet long, and are said to contain 100 tons of concrete each. Two tiers were built for a length of 580 feet. The completed portion of the wall was 18 feet high, and the upper part was made a hollow subway 4 feet 6 inches wide and 6 feet high. Some 100 feet of this subway was constructed to finished level. The breakwater was carried out to a length of 930 feet—350 feet of it being 16 feet high, 350 feet 10 feet high, and the remaining 230 feet 5 or 6 feet high. It is built over a reef of rocks running outward from the shore and is composed of concrete blocks of about 100 tons weight each, built in place and keyed together. A good graded road 20 feet broad in its centre portion was made from Hulutao to Wanghaiszu, a distance of about 3 miles, and it was anticipated that Wanghaiszu, with its picturesque situation and abundant water supply, would prove an attractive locality for private residences, etc. In addition, a pathway some 10 feet wide was made along the face of the hills, forming the promontory at Hulutao, thus giving access to it for its whole length, some 3 miles in extent. The water supply at Hulutao was found to be neither sufficient nor reliable. A copious supply could, however, be drawn from the Lienshan River, some 3 miles distant. Four permanent two-storied buildings constructed of concrete blocks, including an hotel of good appearance containing 19 bedrooms, in addition to dining, drawing and billiard rooms, were completed by the beginning of 1912. In addition, telegraph and telephone lines were laid connecting Hulutao with Lienshan station. When the work was suspended, at the end of 1911, it was anticipatd that another year's work would have advanced the breakwater sufficiently to enable the first ship that arrived to come alongside. In these circumstances it seems lamentable that work costing some $470,000 has been suspended since the end of 1911 and the fruits of previous endeavors left unsupported to battle with the elements. The partially completed seawall now presents a very dilapidated appearance and is seriously broken in parts. The branch railway to Lienshan station, on the Peking-Mukden line, the cart roads to Lienshan and Wanghaiszu, the branch telegraph and telephone lines, all give evidence of neglect during the past decade, and there would seem to be little or no prospect of work on the Hulutao harbor scheme being renewed in the immediate future.



Philippine Coal Supply

A MOST interesting and valuable compilation of facts and figures about the coal supply of the Philippines is contained in a booklet issued by the Manila testing laboratory. During the year 1920 more than Pesos 9,000,000 worth of coal was paid for according to the valuation of this laboratory which has now become of prime importance to the industries of the Islands. Since its inception, the laboratory has analyzed over a million and half tons of coal for its clients, and all the principal coal mines in Australia, Borneo, China, Manchuria and Japan have been visited and the coal sampled. The methods of sampling, analyzing and the laboratory apparatus is the same as recommended by the American chemical society and use by the United States bureau of mines. In the various instances where a comparison was made of the analysis of the Manila laboratory and the government bureau, the average difference in calorific value did not exceed one-half of one per cent. For this reason, and also because of a close agreement between the two laboratories, the analysis of the Manila laboratory can safely be used in bidding under government specifications to the U. S. army quartermaster department. The service performed by this laboratory for its clients consists of drawing and enforcing contracts for the delivery of coal, giving advice and information about the coal market, and assisting the purchaser to secure the most suitable coal for his requirements at the lowest price.



Below are given the results of coal examinations made for the principal clients. The penalties collected, because of the delivery of coal of lower value than the guarantee, due to inferior quality or substitution, averaged P.0.85 per ton, which is more than six times the laboratory charge of P.0.13.

Calendar Year 1920

Name of purchaser.	Tons purchased.	Net penalty collected.	Cost of expert and laboratory.
Iusular Government ..	58,317.98	P.68,801.54	P. 7,581.33
Manila Railroad Company	76,612.01	70,560.59	9,959.56
Manila Electric Company	89,841.61	50,635.49	11,679.41
Total	224,771.60	189,997.62	29,220.30
Per ton		0.85	0.13

Adding to the above tonnage that of smaller clients and also the examinations made for coal companies will bring the total tonnage handled by this laboratory to approximately one-half half of the total imported into the Philippine Islands.

* * *

The source of the Philippine coal supply varies every few years; the product of certain countries rise, flourish and are replaced by others in conformity with economic conditions. The laboratory records contain data on a great many more coals than here shown as many coals from Japan and other countries, formerly sold in large quantities, are not now imported. It was in anticipation of the Australian revival that the writer (who did not come to the Philippines until 1910) visited Australia in 1919 in order that reliable and exact information about all of their coals would be available. From 1903 to 1910 nearly all of the coal came from Australia, amounting to over 300,000 tons in 1908, 90 per cent. of the total importation for that year. When the post-Russian-war embargo in Japan was lifted however, Japanese coal commenced to replace Australian, and, since 1912, has supplied, with the exception of one or two years, 70 per cent. of the total importation, the Australian coal disappearing from the market in 1916. The year 1920 witnessed the first serious attempt of Australia to enter this market again, 130,000 tons being imported as compared to 20,000 tons in 1919; but, owing to government restrictions, it is now impossible to get the best quality, Maitland, and very difficult to get Borehole coals, only inferior coals being offered.

Manchurian (Fushan) coal, from 1913 to 1918 inclusive, averaged 45,000 tons per year, but, owing to other demands, has disappeared from this market, being replaced by Formosan coal, which began in 1918 and increased to 77,000 tons by 1920. Indian coal was first imported in 1919, 5,000 tons, and in 1920, 31,000 tons, but at present there is an embargo on exportations. British Borneo (principally Sebatick) commenced in 1908 and has since supplied this market annually with from 3,000 to 18,000 tons. North China coal (Kaiping field) entered this market in 1912 and has since averaged 50,000 tons per year. From time to time cargoes of coal have been brought in from South Africa, Dutch Borneo, French China and other Chinese fields but have proved to be either of inferior quality or else unsuited to the requirements of this market. Four years of exorbitant prices for imported coal, about 300 per cent. above pre-war prices, have not been able to raise the production of Philippine coal mines above an insignificant figure. This is partly due to scarce, inefficient and expensive labor, but, principally, to physical conditions which only permit of mining on a small scale and make the overhead charge per ton excessive.

The tonnage for the year 1920 given in this article does not agree with that from other sources, but is correct, since it was tabulated from reports made by each contractor of the cargoes that he purchased for his own business. The reports give time of arrival, name of vessel, port of shipment, tons in cargo, etc., and most of these cargoes could be checked by the records of this laboratory.

* The ton used throughout this article contains 2,240 pounds, or its recognized equivalent in the Philippines, 1.016 kilos. The par value of the Philippine Peso (P) equals $0.50 United States currency.

Individual Imports of Coal, 1920.

Contractor.	Tons.	Per cent.
Madrigal & Co.	247,003	39.23
Mitsui Bussan Kaisha	227,121	36.07
Pacific Commercial Co.	52,292	8.30
H. R. Andreas	23,548	3.74
Grimes & Co.	10,180	1.61
Macondray & Co.	8,155	1.30
W. F. Stevenson & Co.	4,901	0.78
Hoa Hin Co.	2,500	0.40
Metzi Bordman Co.	2,041	0.32
Direct importation for private use	15,524	2.47
U. S. Navy (United States coal)	36,399	5.78
Total importation	629,664	100.00

Coal Mined in the Philippine Islands, 1920.

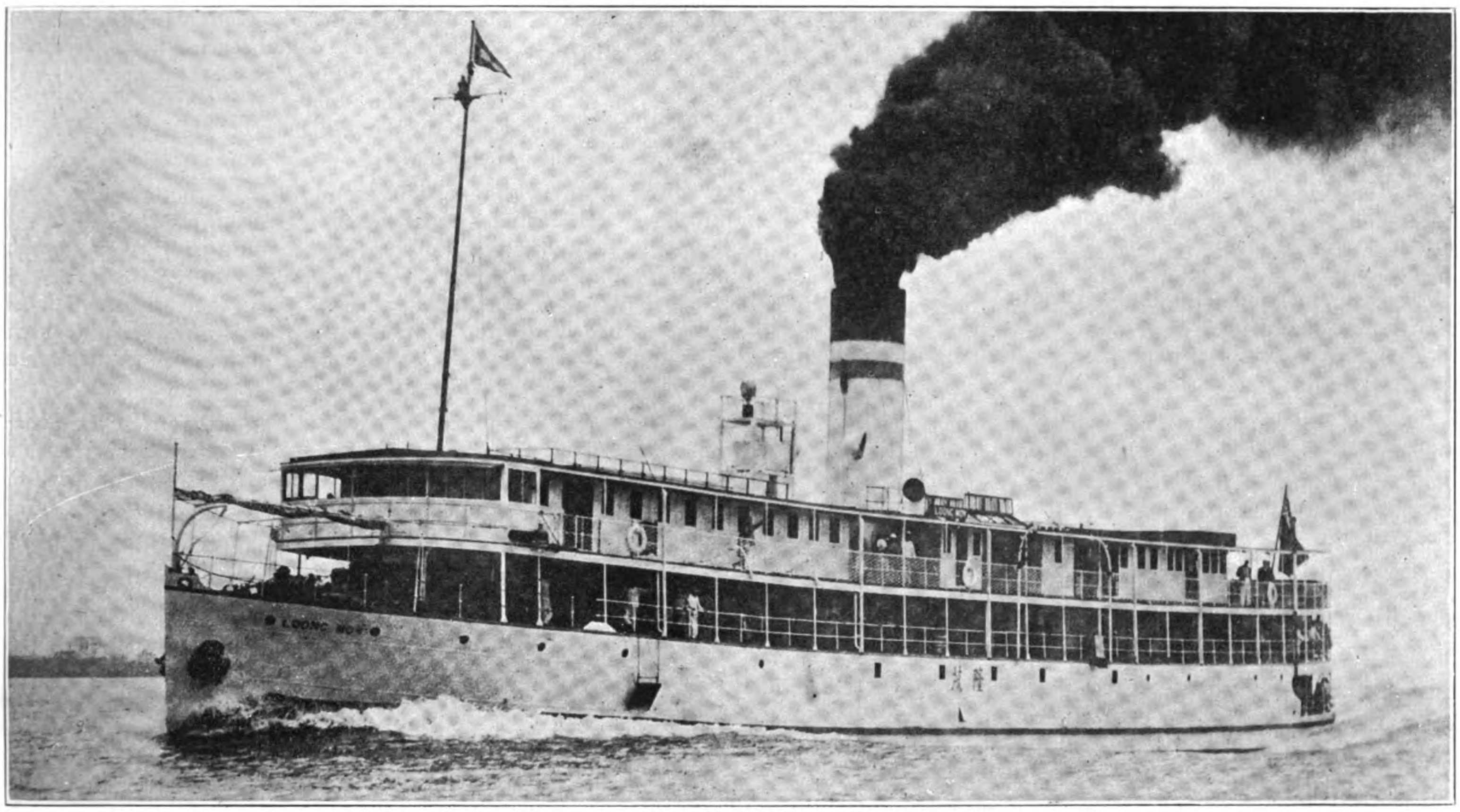
Mining Company.	Island.	Mined at—	Tons.	Tons.
National Coal Co.	Mindanao	Malangas	..	3,075
do.	Cebu	Compostela	2,831	
Uling Coal Mines, Ltd.	do.	Uling	2,978	
J. Clayton Nichols	do.	Toledo	None	
D. M. Carman	do.	Danao (estimated)	2,239	
				8,048
Philippine Coal Mining Co.	Batan	Batan	..	35,000
Total				46,123

Distribution of the Normal Coal Consumption of the Philippine Islands

Consumer.	Tons.	Tons.
U. S. Army:		
Manila		90,000
U. S. Navy:		
Cavite and Olongapo		50,000
Insular Government:		
Manila and Outports		40,000
Railways:		
Manila Railroad	80,000	
Philippine Railway	10,000	
		90,000
Electric Plants:		
Manila Electric Company	80,000	
Iloilo Electric Light Company	4,000	
Visayan Electric Light Company	2,000	
Cavite Electric Light Company	2,000	
		88,000
Cement works (estimated)		6,000
Oil mills (estimated)		10,000
Gas Works:		
Manila Gas Corporation		8,000
Ice Plants:		
Philippine Cold Storage	3,000	
Fabrica de Hielo de Manila	4,500	
Cebu Ice Plant	1,000	
Iloilo Cold Storage	1,000	
		9,500
Cigar and Cigarette Factories:		
Cia. Gral. de Tabacos de Filipinas	2,500	
Germinal	1,000	
La Insular	1,000	
El Oriente	500	
Alhambra	500	
La Yebana	500	
Helios Cigar Factory	250	
La Flor de Intal	250	
		6,500
Breweries:		
San Miguel	5,000	
Oriental	2,000	
		7,000
Distilleries:		
La Tondeña	1,200	
Ayala y Cia.	3,500	
Watson	500	
Los Baños	500	
Ynchausti	700	
Legarda	400	
		6,800
Sugar Factories:		
Silay Sugar Central	1,500	
Ynchausti	2,500	
Calamba Sugar Estate	1,000	
Pampanga Sugar Mills	1,000	
Mindoro Sugar Company	3,000	
San Carlos Milling Company	2,000	
		11,000
Engineering Works:		
Atlantic, Gulf and Pacific Co.	3,000	
Earnshaw's Slipway	1,000	
Sanitary Laundry Co.	1,000	
Colorado Mining Co.	1,000	
San Carlos Iron Works	500	
		6,500
Sawmills:		
Derham Lumber Co.	800	
Insular Lumber Co.	(?)	
Cadwallader-Gibson Lumber Co.	1,200	
Oriental Sawmill	500	
		2,500
House coal, etc.		10,000
Ocean-going steamers		15,000
Coasting steamers		69,800
Steam Launches and Ferries:		
Manila	15,000	
Cebu	10,000	
Iloilo	10,000	
		35,000
Miscellaneous		8,400
Grand total		570,000

Hunchun Improvements

THE road construction bureau, says the customs reports, established in 1919 for the improvement of communications, seems to have limited its activity during the year to the collection of the road tax on carts. On the other hand, the Korean authorities have been energetically pushing the improvement of communication on their side of the frontier. The seaport of Ungi, some 60 *li* south of the Tumen, was opened in the summer to foreign trade and residence and is now visited by the larger steamers of the Japan-Korea coasting lines which formerly terminated their run at Seishin. Also, a road has been practically completed which will greatly facilitate wheeled traffic between Kamisambo, the present northernmost terminus of the Seishin-Huining Railway, and Keigen, a town in Korea facing Hunchun at about 40 *li* distance. Towards the end of the year an electric-light plant was installed in town by a Chinese concern, with the assistance of two Russian mechanics. It supplies light for public and private use, and power is supposed to be also available for operating a flourmill and a sawmill. If successful, the venture may initiate an era of industrial development in the district.



S.S- "Loongmow" on the Measured Mile. Speed 15.1 Knots

Improved Type Shallow-Draft Steamer for Upper Yangtze River

By H. P. KING

THE industrial nations of the world are taking an increasing interest in the development of the natural resources of China, which is becoming to be regarded as the world's greatest potential market for machinery, engineering material and manufactured goods generally, and as a country which can supply the world with vast quantities of raw material. Before these natural resources can be developed, however, China must be furnished with far greater transportation facilities than she now possesses. Great railway projects are under consideration, and will, no doubt, be put in hand once the political and financial conditions in China permit of the safe investment of foreign capital. For the present, however, we are concerned more with the utilization of China's vast waterways and the developments that have taken place during the past few years are very interesting. A very good example is the development of steamship facilities on the upper reaches of the Yangtze River. Not only is this development interesting from the point of view of increased transportation facilities but also because of the technical problems that have had to be solved by marine engineers and shipbuilders before a suitable type of steamer was evolved for the service.

Up to May, 1920, there were four small steamers of a special type plying between Ichang and Chungking, the nearest river port of Szechuan, which is generally regarded as China's wealthiest province. While these four vessels filled a long-felt want they were not sufficient to meet the increasing passenger and freight traffic, and it became obvious that an improved and more powerful type of steamer would have to be provided. The problem to provide this improved type of vessel was not an easy one to solve; this will be apparent when the natural conditions prevailing on the river are considered.

The distance between Ichang and Chungking is about 400 miles, and the rise in the water level between those two ports is, in normal conditions, 500-ft., and, on occasion, may rise to 600 or 700-ft. The depth of water between the end of November and the end of April, when the melting snows in the mountains of Thibet cause the water to rise very rapidly, is insufficient for vessels of more than very shallow draft. The normal current between Ichang and Chungking is generally between four and eight knots, and at times is as high as 13 knots in the rapids. Bearing these facts in mind it will be realized that vessels, to be successful in this trade, must be of shallow draft, of high engine power, and of exceptional steering abilities. Owing to the ever-present danger of striking the numerous rocks in the rapids they must be provided with adequate protection in the shape of watertight bulkheads. It is true that these problems have been solved to some extent for dealing with less exacting conditions in other parts of the world, but nowhere else are the conditions as they are on the Upper Yangtze, and all the more credit is therefore due to those who have successfully surmounted the difficulties that have had to be faced before an entirely satisfactory type of steamer was produced. These difficulties were overcome with careful study and observation, and we give the details of this new type of steamer which has proved very successful on the Upper Yangtze service. This vessel, the *Loongmow*, belonging to Mackenzie & Co., of Shanghai, and built and engined by the Kiangnan Dock & Engineering Works, of Shanghai, completely revolutionized all previous ideas on the subject of steam navigation through the Yangtze Gorges, and proved an immediate success. So much so, indeed, that immediate orders were placed with the Kiangnan Dockyard for four duplicates, and in July last two further vessels of the same type were ordered by Japanese interests.

The vessel is subdivided into nine watertight compartments by eight transverse bulkheads. Passenger accommodation is provided for 16 first-class foreign passengers, 40 first-class Chinese

passengers, 80 second-class Chinese passengers, 100 third-class Chinese passengers, 200 steerage or deck passengers.

The dimensions of the *Loongmow* and her sister ships are as follows :--

Length, overall..	204-ft. 11-in.
Beam	31-ft.
Deadweight (capacity)	400 tons
Speed	15 knots
I.h.p.	3,300

The machinery installation consists of two sets of high-speed tri-compound engines of 3,300 i.h.p., and steam is generated by two Thornycroft boilers working under forced draught and a pressure of 250-lb. per sq. inch. The following auxiliaries are fitted :—

One Weir mono type air pump.
Two Weir feed pumps, with surface feed-heater.
One Weir evaporator.
Independent circulating pump.
Two electric generating sets, one steam and one oil-driven.
Auxiliary steam pumps for general service, fire and salvage.
One steam warping capstan specially adapted to warp the vessel over the rapids if necessary.
Steam and hand steering gear of builders' design for this special service.

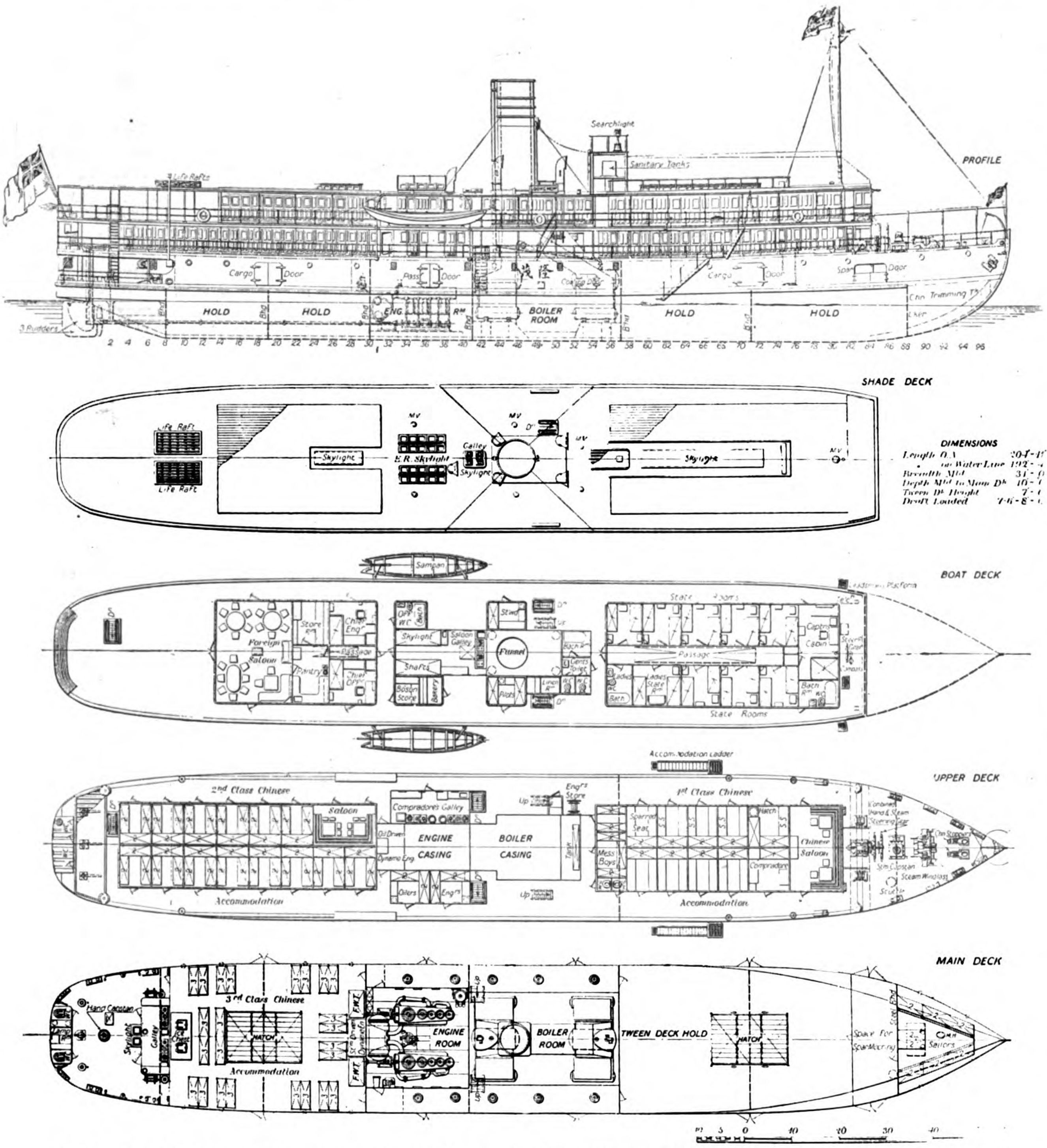
The whole of the machinery and hull were built under special survey of the British Corporation for the survey and registry of shipping, and has the Corporation's highest river classification. The *Loongmow* is understood to be the first ship of this type ever classed by any classification society. Since then the British Corporation has classed four similar vessels, and the American bureau of shipping two vessels of the same type, all built by the Kiangnan Dock & Engineering Works at Shanghai.

The vessels on the service previous to the advent of the *Loongmow* and her sister ships had all to be warped over the rapids at one time or another, but, though the *Loongmow* went up with the highest water level on record she did so without warping.

The actual distance between Ichang and Chungking is 392 miles, and the *Alice Dollar* commenced her service on the run by doing the round trip from Ichang to Chungking and back in four days and 12 hours, this was repeated by the *Kiangking* on her maiden voyage. This record has, however, been beaten since by the *Loongmow* by six hours. The *Alice Dollar* has made the run between Ichang and Chungking in 37½ steaming hours.

The two vessels now building for the Kaiyosha Company, of Japan, are designed to carry 380 tons d.w. on 7-ft. draft, and to steam 14 knots. The steamers are being provided with tackle to handle lifts of five tons.

It is very interesting and pleasant to record that this development in shipbuilding is largely due to the friendly rivalry of Yarrow & Co., of Scotstoun, and the Kiangnan Dock & Engineering Works, of Shanghai.



Shallow-Draught Steamer "Loongmow," for service on ihe Upper Yangtse River, China. Built and Engined by the Kiangnan Dock & Engineering Works, Shanghai

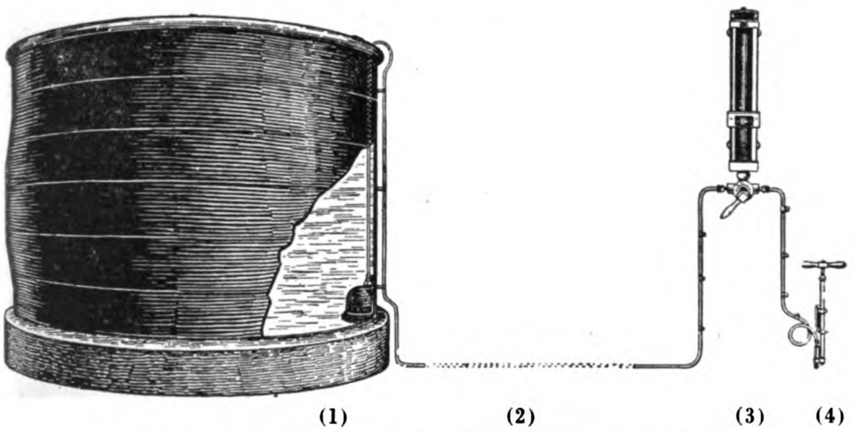
The Pneumercator System

THE pneumercator system has been designed primarily to provide means for the indication at a distant point or station of the quantity of liquid stored in a tank or other vessel.

For example, on shipboard it is employed for the indication in the boiler room or engine room of the quantity of fuel oil in the fuel oil bunkers and settling tanks.

Again in the case of large storage tanks for fuel oil, say on the riverside, the system is applied to indicate the weight of oil in the tanks, the indicating gauge being placed in the office of the superintendent, or other convenient position.

The pneumercator system is an interesting application of the pneumatic transmission of hydrostatic pressure due to a column of liquid to a distant observing station whether the liquid column be the height of a tide, the level of a river or reservoir, the depth of valuable liquid in a storage tank employed in some industrial process, the fuel oil in a ship's bunker, or otherwise.



(1) (2) (3) (4)

Fig. 1. General Features of the Pneumercator Apparatus

The essential features of the normal apparatus are illustrated in Fig. 1.

The inverted hollow hemispherical vessel (1) is fixed at or near the bottom of the tank. In its side a sharp edged orifice is cut which forms the datum or zero line from which measurements are made.

To this "Balance Chamber" as it is styled, a small air pipe (2) is connected and led away to the distant indicating gauge (3). This pneumercator gauge is a robust form of mercury column pressure indicator.

Near the gauge is located a hand operated air pump connected up to the system by means of a control cock (4) which is an important feature of the system.

The elements of the system are of extreme simplicity and the principle of operation is as follows:

Imagine the tank empty and that liquid is pumped in—as soon as it covers the sharp edged orifice air is trapped in the balance chamber.

As the level of liquid rises in the tank the head of liquid above the orifice impresses a corresponding pressure on the imprisoned air, which pressure is transmitted by the small air tube to the mercury indicating gauge. (Fig. 2.)

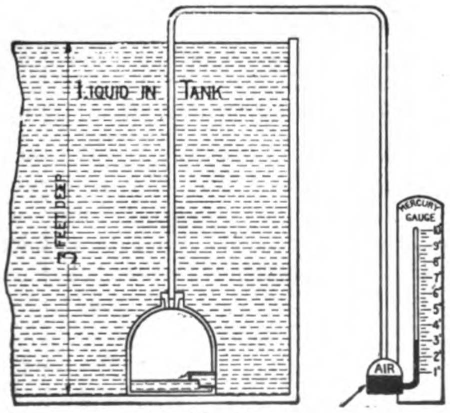


Fig. 2.

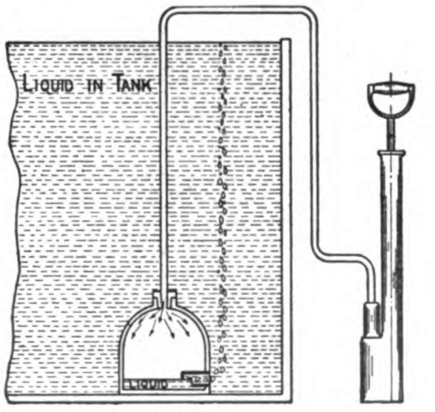


Fig. 3.

The control cock (4) allows of this pressure being applied to or cut off from the gauge or again allows of the gauge being isolated and vented to atmosphere. It further allows of the air pump being connected directly to the balance chamber by way of the air piping (2).

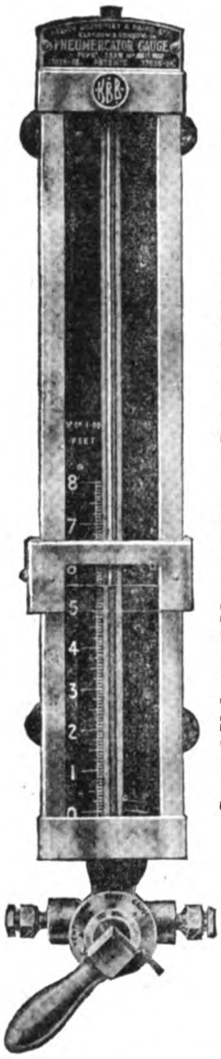
Since, as the head of liquid and consequently the pressure on the imprisoned air, is increased, its volume will decrease, liquid will enter the balance chamber and thus cause a false datum of measurement by raising the liquid level in the balance chamber slightly above the orifice or datum level.

This is overcome by the provision of a simple hand air pump, which, used in conjunction with the gauge control cock, allows of air being pumped into the system so that the liquid in the balance chamber is depressed to the sharp edged orifice and thus the datum in measurement is maintained.

A few strokes of the pump are made before each reading so that all readings are made with a perfectly definite datum of measurement.

During the use of the air pump any excess air pumped in freely bubbles out at the balance chamber orifice and does not affect the datum level. (Fig. 3.)

By means of the control valve the air pumped into the system is deflected past the gauge, so that no air flow through or over the indicating mercury which would tend to exodise the mercury and render it sluggish in the gauge indicating tube, is allowed.



Control Valve and Mercury Column Pressure Indicator

The control valve is now turned to connect the balance chamber to the gauge so that the pneumatic pressure in the balance chamber due to the head of liquid above its orifice (and datum level) is transmitted through the air tubing to the mercury gauge and the mercury column rises to a height exactly equivalent to the head of liquid in the tank.

By putting the control cock to "vent" the mercury chamber as well as the upper end of the indicating gauge tube are opened to atmosphere and the mercury falls to the datum level zero on the gauge scale. Thus the gauge zero can be checked at any time.

The operation of the air pump before taking a reading ensures the correct maintenance of the datum level in the balance chamber. If insufficient air had been pumped in the fact is disclosed by repeating the operation where a higher reading on the gauge will be obtained, thus the gauge is self-checking.

Changes of temperature of the air line system have no effect on the accuracy of the gauge. If, for example, the air line is heated up

the air in it expands and the excess volume bubbles out at the balance chamber orifice. If the air line is cooled and the air in it contracts, the tank liquid rises very slightly in the balance chamber, but when the air pump is operated for the next reading the air volume is restored and the datum level regained.

Since the transmitting medium is air only, the gauge may be above or below the tank or at any reasonable distance from it.

The gauge may be scaled not only to read depth, but also weight or volume of tank contents.

The pneumercator system permits of coupling one indicating gauge to a number of tanks where this is convenient, the gauge being connected with any one of the tanks as desired by means of "selector" valves operated at the observing station.

It can be applied to tanks under internal pressure or vacuum, the internal pressure being compensated for by leading a second air tube from the tank top to the top of the gauge column, leaving the actual liquid head only to operate the mercury column.

When desired, the gauge may be fitted with an annunciator by means of which alarms and signals are given when pre-determined levels of liquid in the tanks are reached. The gauge mercury column brings this alarm gear into action, no wiring or contacts at or near the tank being required.

This particular system has been in successful use for some seven years and a large number of oil fuelled ships are fitted with the pneumercator system for indicating in the boiler or engine rooms the fuel oil bunkers and settling tanks.

An installation of particular interest is that fitted on board the R.M.S. *Aquitania*, where some 46 tanks are dealt with.

Another installation of interest is that on board the U.S.S. *New Mexico*.

The applications to liquid measurement in tanks and reservoirs on land have been very extensive and such liquids as

Fuel oil	Ether
Tar oil	Liquid ammonia
Tar	Vinegar
Paraffin oil	Milk
Crude oil	Molasses
Tempering oil	Sulphurous acid
Petrol	Sulphuric acid
Benzol	Phosphoric acid
Alcohol	Nitric acid
Methylated spirits	Caustic soda
Cottonseed oil	Brine solution
Castor oil	Bleach liquor
Linseed oil	Fresh water
Olive oil	Sea water
Etc.	Etc.

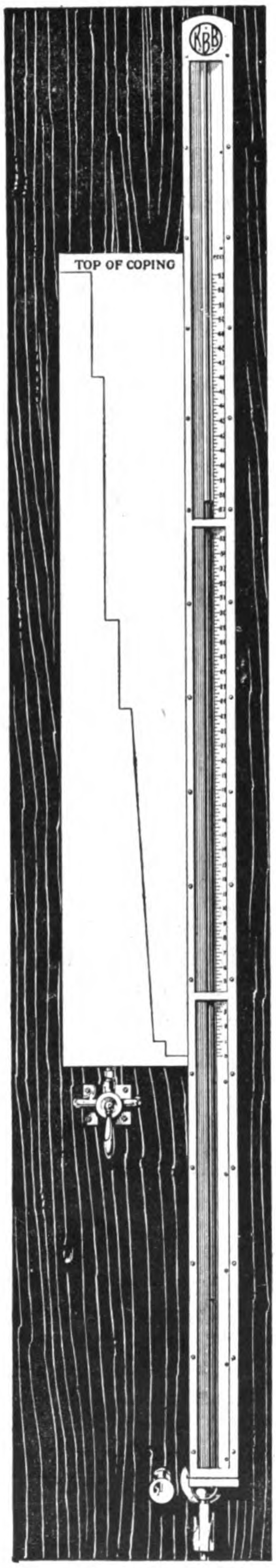


Fig. 4. Pneumercator Guage to Register Level of Water in Filling Dry Decks.

have been successfully dealt with by the pneumercator system described.

In many cases the control of stocks of valuable liquids from the office by having visual indications thereof the quantities in the various distant tanks controlled, has resulted in considerable benefit. Accurate knowledge at all times on the part of those in charge tends to detect leakages and promote efficient control.

Many tanks in factories carrying liquids used in manufacturing processes are difficult of access and measurements provided by the pneumercator system without necessity to visit the tanks and "sound" them have proved of the greatest value in the economical use of the liquids on the part of the employees.

A particular case, that of one of the large superelectric power stations is of interest. The boiler feed tanks were some 50-ft. above the boiler room firing floor and somewhat difficult of access. Several schemes for indicating these tanks on the firing floor were considered, but the mechanical complications rendered these schemes impracticable. By means of the pneumercator system this problem was solved in a most satisfactory manner, the air tubing being run like ordinary electric light wiring.

The case of dry dock control may also be cited. A pneumercator gauge fixed in the pump house enables the pump operator to know at any moment the level of water in the dock. The gauge is sometimes made to give a graphic picture of the state of the dock by means of a profile of the dock (to scale) affixed to the gauge as shown in Fig. 4.

A very interesting application of the system is to indicate in the chart house of captain's room on board ship, the fore and aft draughts of the vessel.

The head of water above the ship's keel operates the gauge which is scaled to show draft in feet and inches and such scale can be read to half an inch.

The precision thus attained is of course very much greater than that yielded by reading the hull draught marks, the observation of which is often very difficult, especially at night.

Construction Work in China

In keeping with conditions obtaining in many other portions of the world, Shanghai, the commercial metropolis of the Far East, was, with the completion of the war, short of housing accommodations. During 1920 twice as much building was undertaken as in 1919, and in 1921 double that for 1920. It is safe to estimate that the equivalent of $50,000,000 silver was put into dwellings in Shanghai during 1921, providing for nearly 500 modern foreign-style residences and probably 5,000 Chinese houses, in addition to much construction in business buildings, warehouses and industrial plants. Next after Shanghai, Harbin witnessed the greatest activity, spending probably $30,000,000 silver in this connection.

Quite in contrast is Mukden, where the South Manchuria Railway during the past few years built in excess of the city's demands, so that to-day scores of modern expensive buildings stand in the Japanese section of the city unoccupied. Tsingtao also figured prominently during the year in construction work. Naturally all these building operations drew heavily on supplies of materials, particularly reinforcing bars, which accounts for the substantial reduction in stocks on hand at the beginning of the new year.

Much building construction has been completed or is under way at Canton. Plans for the improvement of the water front, for the construction of a bridge from Canton to Honam, and for railway terminals, public warehouses and industrial sites are worked out in detail, and overtures are being made to secure the financing of the work.

Work is proceeding on the construction of the blast furnaces at Chinwangtao, capacity 200 tons daily; Lungyen near Peking, capacity 250 tons daily; and Ta-yeh, capacity 500 tons daily. The latter two are being constructed with American materials.

THE FAR EASTERN MOTORS

Supplement to the "Far Eastern Review"

Devoted to the Development] of Automotive Interests in the Far East

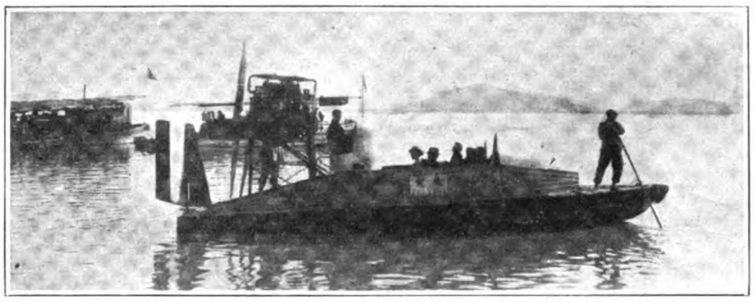
The Hydro-Glider in China

A Dumont-Galvin Performance on the Tsien-Tang River in Chekiang

By Dr. E. L. Tartois

CHINA'S transportation facilities are limited, railways are insufficiently developed and there are practically no roads. The construction of a suitable system of roads and railways will take much time and money, and for some years to come the wonderful net-work of rivers and canals must bear the burden of transportation. With the exception of the Yangtze, which lends itself to steam navigation (although with great difficulties in its upper reaches), all other rivers and their tributaries are filled with shoals and rapids, especially during the season of low water when they are navigable only by shallow draft junks poled or towed with great difficulty by coolies. Two methods therefore present themselves for the proper utilization of these inland waterways for the transportation of passengers and goods: the hydro-plane or the hydro-glider. Although more advantageous than the aeroplane for commercial uses, the carrying capacity of the hydro-plane is too small.

The hydro-glider is a boat of special design driven by an aerial propeller, and whose shape of hull permits it when driven at a certain speed, to lift almost completely out of the water thus avoiding the water resistance, which in the case of an ordinary boat, increases tremendously in relation to its speed. As its name indicates, the Hydro-glider, glides along the surface of the water. The builders of fast motor-boats long ago learned that with an increase of speed the boat lost some of its weight, and by successive trials improved the shape of the hulls in order to amplify this effect. The effect, however, of lifting the bow, plunged the stern deeper under the water by reason of the powerful suction exercised by the propeller. The resistance of the water on the hull increased so rapidly with the speed that even a slight increase was accompanied by a disproportionate increase in power.



The Fei-Long at Zakhou

Finally, the weight of the engine for a determined hull, added to the weight of fuel and the carrying capacity, that these high-speed motor-boats lost all commercial efficiency and became useless except for speed maniacs. The application of aerial propellers to aeroplanes and the hulls of sea-planes brought to light new principles in propulsion, especially the necessity of providing the bottom of the hulls with one or two " nicks " or steps (see Fig. 1). The function of these steps is to break the water pressure in several places, which, otherwise acts as a brake and reduces speed. Therefore, it was determined that aerial propulsion, shapes specially designed to decrease the friction of the water on the hull, with well calculated slopes of the planes, constituted the essential elements for the realization of a successful hydro-glider.

The principal advantages of the glider may be condensed as follows:

1. Sliding along the surface of the water, the glider is practically unaffected by currents, whirlpools or rapids. An ordinary boat going against a current of certain strength will have its speed reduced in accordance to certain formulae too long to explain here. On the other hand, the speed of the glider for the same scientific reasons is slightly increased.

2. Its draft at full speed, being practically nil, the glider can easily navigate streams which even a sampan would find difficult, thus making it the ideal means of passenger transportation and mails on shallow waters, with rapids, a feature of nearly all Chinese rivers.

On the other hand many gliders at the outset had certain disadvantages which limited their practical employment but which have been corrected until the boat is now highly efficient for commercial transportation. Foremost among the types which have entered the field in France and China and given excellent results, is the Dumont-Galvin glider. A description of this type follows:

Its chief characteristic is the new form of the hull, whose lines are very like those of a sharp nosed launch cutting the water. This machine marks the attainment of the goal sought after during a continuous study of its working under conditions corresponding to those actually encountered and is an interesting practical and commercial proportion.

The Dumont-Galvin machine is a fast and light glider, light enough to be hauled on a wheeled truck to its garage in drydock or to be transported on *terra firma* and towered into water.

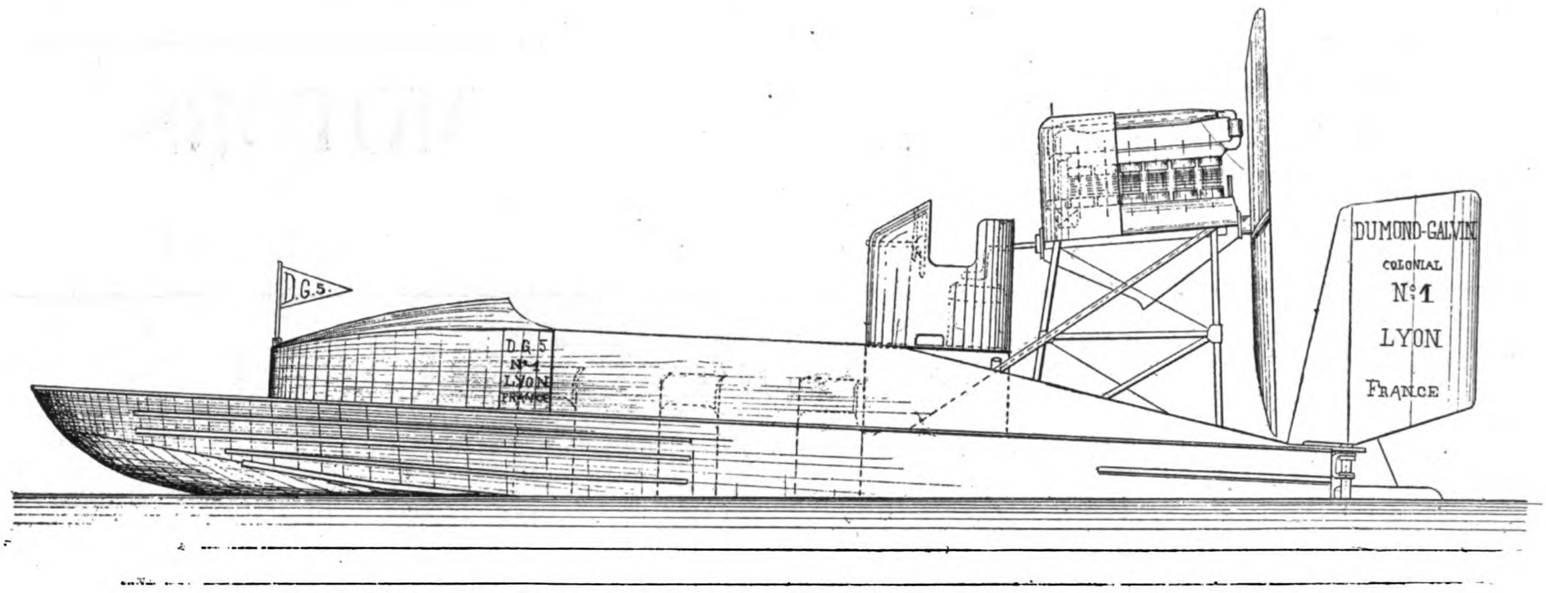
Its corresponds in its class to a large sized motor car, giving the same cost per mile for example.

Provided with a sturdy motor, using crude oil with a very low consumption its non-stop working is certainly more sure than in the case of a motor car, as its mechanism is less complicated and there is less of it and nothing has been sacrificed in its construction to lightness or speed to the detriment of its strength and suitability for commercial uses.

The D. R. type of commercial hydro-glider is fitted with an aerial propeller. Hull of the sea-going model two sheetings of mahogany-bottom copper sheeted to prevent erosion in sandy waters.

Divided into six water-tight compartments, in addition carries four air tanks sufficient to keep the boat afloat in any case.

Length between perpendiculars	30′ 8″
Breadth	9′ 11″
Carrying capacity (deadweight)	1.3 ton
Draft, loaded (stopped)	7″ 3/16
Draft at full speed	practically nil



Colonial Model No. 1 of the Dumont-Galvin Hydro-Glider

Crew accommodation two seats, one for the pilot, who is at the same time the mechanic, one for a sailor boy.

Passengers accommodation :

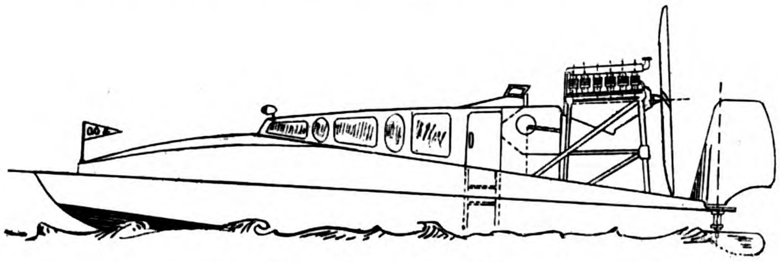
Open cockpit covered by collapsible awning with seats for ten passengers or closed cabin with seats for eight passengers.

Weight, empty .. .. 2,400-lb.

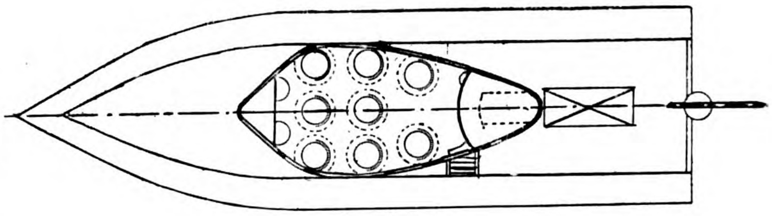
The closed cabin makes an extra-weight of 330-lb. Motor 6 cylinders in line (low compression and low rate of revolution).

The boat is fitted with an aerial rudder and will at full speed turn within a circle of not more than 130-ft. In addition a water rudder (taken outside the water at full speed) is used for steering at slow speed.

The motor is of industrial type and is more reliable than a motor-car engine because of the low compression (50-lb. per square feet) and the low rate of revolution (600 R.P.M.). It does not require any specialist and can be easily put in the hands of a Chinese mechanic.



Closed Colonial Model



Seating Plan of Closed Model

Propeller four-bladed or two-bladed large pitch directly coupled to the motor shaft.

Full power	100 H.P.
Mean power requested	70 H.P.
Necessary speed to alight from water ..	18.6. st. Miles per h.
Commercial speed	28 st. Miles per h.
Full speed (momentary)	37 st. Miles per h.

Capacity of fuel tank sufficient for 11 hours.

Kerosen consumption	7 Imperial G.p.H.
Lubrication oil	1/4 Imperial G.p.H.

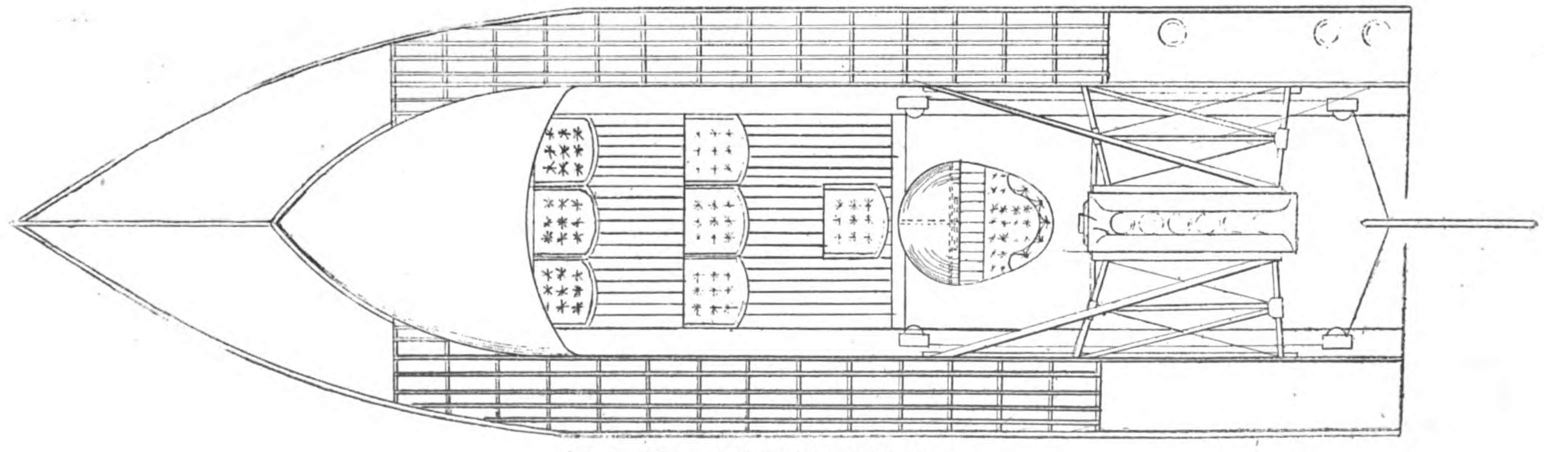
It works for several thousand hours without repairs. It is fitted with two carburettors, double sparking plugs and magnetos. Starting magneto and starting handle.

It starts easily by hand.

It burns Kerosen—a great advantage in China and the fuel consumption is garanteed not to exceed 7 gallons per hour.

This craft is quite different of the others made specially for speed in perfectly calm waters.

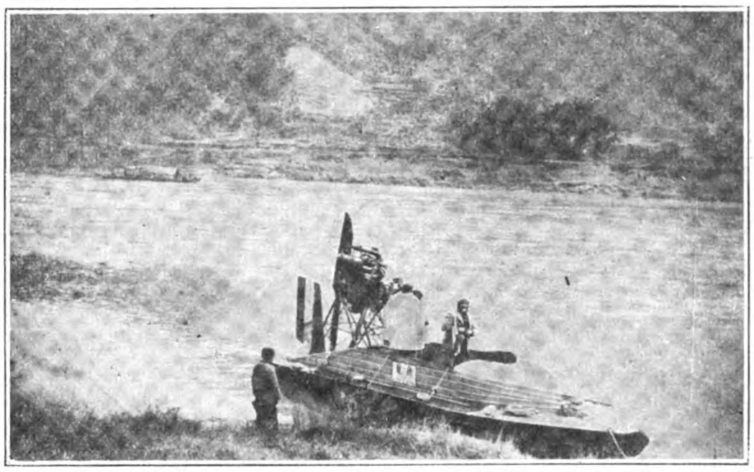
The hull is built on the lines and has the sea worthiness of a sea boat and is quite safe in strong eddies.



Seating Plan of Colonial Model No. 1

It will be perhaps of interest to add that the fact of the machine gliding on the surface of the water does away with the wake formed by a steam or a motor launch although much slower.

A demonstration trip was recently made at the request of Gen. Lu Yung-chang, tuchun of Chekiang, on the Tien-tang River in that province. This river along which is located several important towns, is the main artery of commerce and communication between the southern parts of Chekiang the eastern part of Anhwei and the provincial capital at Hangchow. Steam launches, even the smallest, are unable to proceed further than Tung-lu about 60 miles from Hangchow. Beyond this point, the difficulties begin. The river widens, narrows, shoals and is filled with sand bars, boulders and reefs, with many dangerous rapids. Junks are towed up the river, and at times the coolies have to pull them by main force over the sand bars. Under these conditions, the so-called "express" passenger junks, require at least six days to make the trip from Zakhou, Hangchow, to Chuchowfu and fifteen days to Tungchi, in Anhwei.



The Fei-Long in the Tilung Tang River Gorges

At the trial trip of the Dumont-Galvin glider, notice was served on the Chinese that it would leave Hangchow in the morning and reach Chuchowfu in the evening of the same day. The notice was received with loud laughter.

On the 12th of February fully loaded with 6 passengers, 80 extra gallons of fuel, in addition to the 80 gallons in the tank, with implements, spare parts, food, etc., the whole weighing about 3,000-lb., the glider started on its trip in a storm of rain and hail. The trip was without incident, leaving at the fixed time and arriving on schedule. We give here the log kept by Mr. B. Hemingway of the Asiatic Patroleum Co., who acted as guide and interpreter.

Official Log of the Hydro-Glider "Fei-long"

12/2/1922.

Zakhou to Chuchowfu via Tung-lu.

7.08 a.m. Left Zakhou.
8.29 ,, Passed Fuyang (90 *li*).
8.42 ,, Stopped for minor engine trouble (dirt in carburettor).
8.47 ,, Resumed voyage.
9.04 ,, Stopped. Dirt in carburettor.
9.14 ,, Resumed voyage.
10.07 ,, Passed Tung-lu (180 *li*).
11.47 ,, Passed Yenchow (270 *li*)
12 noon Stopped to oil engine and for lunch.
12.20 p.m. Resumed voyage.
1.52 ,, Passed Lan-chi (360 *li*)
3.20 ,, Arrived Lung Yu (450 *li*) stopped to pass through pontoon bridge.
3.29 ,, Resumed voyage.
4.55 ,, Arrived Chuchowfu (540 *li*).

Actual time under way, Zakhou to Chuchowfu 9 hours 3 minutes.

14/2/1922.

Chuchowfu to Zakhou, via Tung-lu.

7.30 a.m. Left Chuchowfu. (Heavy rain and strong wind)
9.00 ,, Arrived Lung Yu. Stopped to pass through bridge.
9.05 ,, Resumed voyage.
9.48 ,, Stopped to tighten loose bolt in engine.
9.52 ,, Resumed voyage.
10.30 ,, Passed Lan-chi.
12.09 p.m. Passed Yenchow.
1.52 ,, Arrived Tung-lu. Stopped to take fuel.
2.15 ,, Resumed voyage.
3 ,, Stopped dirt in carburetter.
3.05 ,, Resumed voyage.
3.53 p.m. Passed Fuyang.
5.18 ,, Arrived Zakhou. (Strong head wind between Yenchow and Zakhou. Rough water. Boat behaved beautifully.)

Actual time under way, Chuchow to Zakhou, 9 hours 11 minutes.

Signed : B. Hemingway, Inspector of the Asiatic Petroleum Co.

The only trouble experienced and which could have been easily avoided by taking along a funnel with a filter to fill the tank, and so provided against dirt in carburettors.

The obstacles to an ordinary boat did not exist for the glider. With a draft of less than 1-in., the shallow places did not impede progress and as for rapids, it is impossible to note them.

Making no wash the glider did not disturb, the small craft and as for steering, it is as simple as the driving of a motor car. The glider passed at full speed between native boats and climbed several V shaped rapids without difficulties. The experience gained on this trip enabled the owners to accurately calculate the cost price per ton per mile for freight.

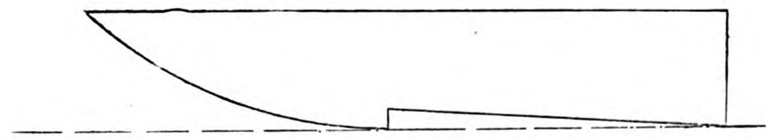
Including every expense: capital, interest, depreciation, repairs, upkeep, insurance, etc., wages of the crew (two men), fuel and lubricating oil, on one side, and on the other side: the efficiency of the boat, weight carried, speed, and hours of utilization, the cost was figured out at Mex. $0.70 per ton mile, or about Mex. $0.07 cents per passenger with luggage per mile.

This price although high, is not prohibitive. It is a little above the cost of transportation by motor car, but much below the cost of transportation by aeroplane. It is out of question to carry coolies in gliders, or to compete with railways or steam boats, but when there is only junks or sampans, the glider is the most economical for the business man with whom time is precious. The price for junk hire is small, this must be added the taels and fatigues of such a trip.

More economical than the aeroplane the glider is much safer, and cannot sink. It is sure to remain afloat. It is easy to steer. Sturdier than the aeroplane, the glider will last a longer time. Its weak point was formerly its aviation engine, too light, too complicated. The substitution of this engine by an industrial type of motor has eleminated this.

Wherever the glider is placed in service, no sheds, no landing places, no roads, or slips are required. The glider can start and stop where it pleases.

It would seem that with its advantages the entrance of the hydro-glider as a means of inland-water transportation, would be welcomed by the authorities. It seems somewhat tragic, however, to learn that the customs officials have refused to grant navigation licenses to these boats, because the treaties do not provide for hydro-gliders navigating inland waters! The demonstrations have, however, interested the Chinese, and by the end of this year regular services of gliders will exist on several rivers, with the certainty that the traffic will increase from year to year.



Showing the "Step" of the Hydro-Glider

Lubrication Its Relation to Engine Wear

Prepared by the Engineering Division of the Vacuum Oil Company

THE erroneous impression has existed for quite some time that after an engine has seen considerable service, the wear produced by such service on the metallic surfaces necessitates the use of oils heavier in body than were originally suitable. Further, that the progress of wear and need for heavier oils may be predicted for all cars on a definite mileage basis.

If we apply the acid test of scientific engineering analysis to this practice, we find that it is based entirely on the following :—

Fallacious Assumption—No. 1

That wear takes place at substantially the same rate in all makes and types of engines under all conditions of service.

This assumption neglects entirely the fact that there are wide variations in the materials used for cylinders, pistons and piston rings in different makes of cars ; differences in design and proportions ; differences in manufacturing processes. It also assumes that all owners will accord their cars the same care.

It must be evident that variations in any of these factors will largely affect the rate with which wear will take place and consequently will make the mileage basis for determining the proper lubricant very inaccurate.

It is well known that the rate of wear of aluminium and cast iron pistons varies widely and that the care exercised in " seasoning " and finishing cylinders and pistons materially affects the life of these parts. Some owners will take no care whatever of their engines and may drive at high speeds. Others will give proper attention to lubrication and drive their cars with care.

For these reasons it must be plainly evident that any system attempting to determine the proper lubricant for all cars on a fixed mileage basis alone must yield results which are wholly inconsistent and not to be relied upon.

Fallacious Assumption—No. 2

That from the time the engine is new, wear is uniformly progressive in proportion to the mileage of the vehicle.

When engines are new, the metallic surfaces in contact with one another are only as smooth as is permitted by the method or methods employed in the finishing of such surfaces.

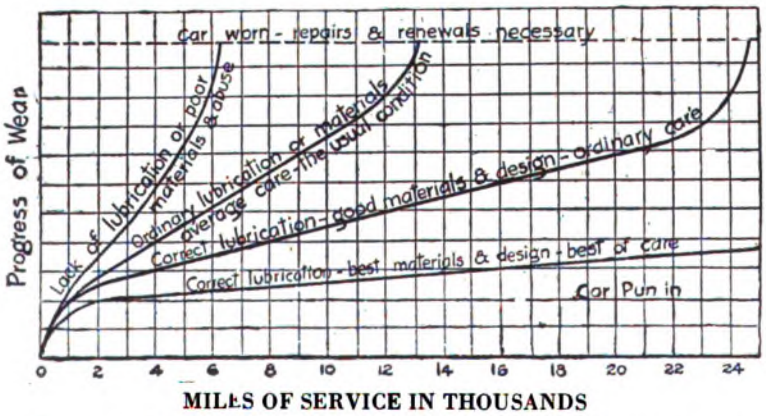


Figure 1.—How varying conditions affect the progress of engine wear

The ideal condition would be the lapping in, or finishing, of these surfaces to give them a high polish, completely eliminating all roughness left by the tools used by the manufacturer in production.

The methods usually employed in the quantity production of automobile engines do not permit of highly finished surfaces being secured. Likewise, the time required for producing such highly polished and finished surfaces would necessitate high cost in production and eventually mean higher cost to the purchaser of the car.

Examination by engineering experts of new cars of many different makes has conclusively proven that the engines, when turned out by the manufacturer, are run in only to a limited degree ; consequently, when the car is received by the purchaser, the metallic surfaces are still somewhat rough.

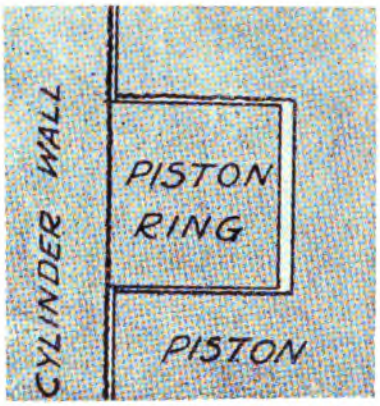


Figure 2.—Emphasizing the roughened condition of cylinder, piston and piston ring surfaces found in new engines.

Because of this it is necessary for the purchaser of the car to operate his engine at moderate speeds and loads for at least 1,000 miles before the rubbing surfaces wear to produce running fits. During this period, however, it is not necessary to use a lighter oil than is correct for the car when run in.

As the parts wear in, there is a slight but nevertheless marked increase in the clearances to the running fits required as indicated in Figure 1 by the first part of the curves. The change in the condition of the surfaces is illustrated in Figures 2, 3 and 4.

Once these polished bearing surfaces and running clearances are produced as a result of engine use, very little wear will occur for many thousands of miles thereafter, if proper lubrication is provided. It must, therefore, be true that if wear takes place to any appreciable extent, such wear is directly due to poor lubricating value of the oil used or in rare instances, to poor design or materials.

When wear has progressed to such an extent that the piston rings possess perceptible up and down movement, the pounding action of the rings on the sides of their grooves tends to increase the enlargement at a very rapid rate. This is the point at which trouble from oil pumping usually commences and the condition existing is represented in Figure 5. Under this condition the clearances have become so large that no oil, regardless of body or character, will prevent oil pumping or overcome blow-by.

To summarize the progress of wear we have, first, the running-in period during which wear is slight but rapid ; next, the period in which the rate of wear is very gradual and dependent upon the degree to which the engine is correctly and efficiently lubricated ; finally, the continued and accumulating wear causes pounding of the rings in their grooves and oil consumption rapidly increases. Excessive wear should be cut short and corrected mechanically by repairs or replacements of the worn parts.

Fallacious Assumption—No. 3

That piston clearances and piston ring fits alone determine the choice of the proper oil.

While it is absolutely necessary that the correct oil be one of ample body and proper character to seal the piston rings against gas leakage under all operating conditions, there are three other equally important factors which must be considered in selecting the correct oil for any automotive engine.

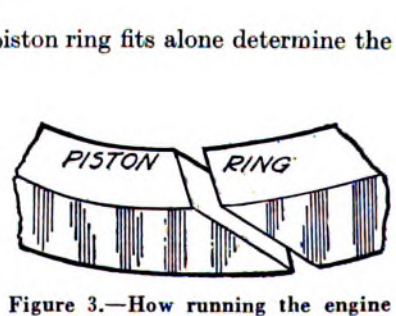


Figure 3.—How running the engine starts the lapping-in process which results in close contact between the piston ring and the cylinder wall.

The first is the operating temperature. This is influenced by the type of service, the type of cooling system employed, the cylinder dimensions, valve arrangement and by the details of design.

Second is the ability of the lubricating system to handle oils of different bodies.

It is well known that certain types of systems will lend themselves better to the distribution of light-bodied oils, while others work best with oils of medium or heavy body. It is also true that in some cases, due to details of the lubricating system, the employment of heavy-bodied oils may prove disastrous, due to lack of distribution of the oil under some operating conditions.

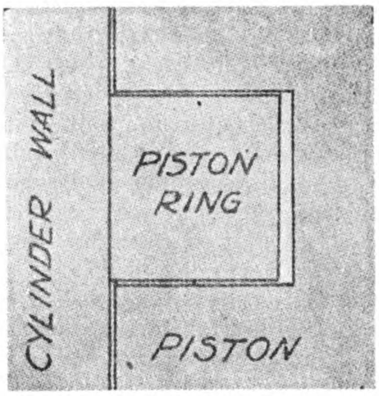


Figure 4.—Illustrating the smoothness of the friction surfaces in the fully run-in engine.

The third factor is carbon deposit. Due to characteristics of design, some engines will not burn cleanly oils of heavy body. The result is excessive carbon deposit which does not form when lighter oils are used. This condition is aggravated when heavier oils are used to overcome wear.

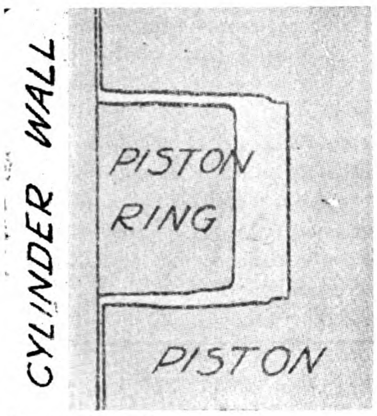


Figure 5.—When ring pounding sets in piston ring slot clearances enlarge to such an extent that no oil will seat the piston rings.

In other words, there are three very important factors which, in addition to piston and piston ring clearances, affect the selection of the correct oil and which may render inadvisable the use of oils of heavy body.

Fallacious Assumption—No. 4

That the use of a heavy-bodied oil in engines that have worn excessively will overcome oil pumping.

Oil pumping is the term usually applied when an engine is using large quantities of oil. In many cases it results in spark plug fouling and almost invariably in carbon deposits.

When oil pumping occurs in cars which have previously worked satisfactorily, heavier-bodied oils are often employed to reduce it.

It is a fact that heavier-bodied oils are usually consumed more slowly than light bodied oils but this remains true regardless of the condition of wear. Hence, if a change is made to a heavier oil in a worn engine this oil will also be consumed in proportionately excessive amounts.

Consequently, when such oils work into the combustion chambers in excessive amounts they are not completely burned but remain to form large quantities of carbon.

Therefore, if the engine design were such that a heavy-bodied oil could not be used when the engine was in good condition, due to excessive carbon deposit, this oil would be still more unsatisfactory when wear permitted it to pass the pistons in excess.

Any other factors of design making unsuitable the use of a heavy oil in a new car would continue to exist regardless of wear and render its use inadvisable.

We find that the determination of suitable lubricants for automobile or motor truck engines on an arbitrary mileage basis is unsound because :

1. *Rate of wear is not constant for all engines.* It varies with the design, material, manufacturing finish and the care given them in service. It is chiefly controlled by the value of the lubricants used.

2. *Wear is not measurable in terms of mileage operation.* The manufacturing finish is an initial variation especially in quantity production and all cars are subjected to a wide difference in care on the part of operators. The selection of the correct oil will minimize wear not affected by mechanical imperfection in design, manufacture and operation.

3. *Variation in piston clearance and piston ring fits are not the only determining factors in the choice of proper oils.* Operating temperatures, oil distribution, and the character of the oil as affecting carbon formation, are of equal importance.

4. *No oil, regardless of body, can seal excessively worn piston rings against oil pumping.* The recommendation of a heavier grade of oil after a short period of engine service is an admission that the oil originally recommended was incorrect.

Summary

The correct oil is the one which meets the conditions of operating temperatures and oil distribution ; which provides a proper piston ring seal and in service leaves a minimum of carbon deposit. By its use, wear is greatly minimized. Such an oil will be of a character to provide efficient lubrication, under all operation conditions, throughout the life of the car. When accumulated wear becomes excessive proper repairs alone will overcome its effects.

Motor Vehicles in China

Recent statistics show motor cars to the value of over three and a half million Haikwan taels were imported into China in 1920, as compared with 1,272,981 and 2,158,998 Haikwan taels for the years 1918 and 1919 respectively.

The bulk of these cars came from America, but British cars are being seen in increasing numbers in the streets of Shanghai and other large towns. Unfortunately the cheapest British cars that come to China are far more costly than American cars of similar model and power, and unless some drastic reduction in the price of British cars can be effected it is impossible for them to hope to be able to compete successfully in Chinese markets. It should further be borne in mind that as yet there are few really good roads in China, cars being used principally for town work, and there is no doubt that for crowded traffic and narrow streets with sharp turnings the low-geared American car is far more suitable than the high-geared British car.

It is satisfactory, however, to note the British motor car manufactures have begun to realize the possibilities of the China market and that several leading manufacturers have recently concluded agency agreements with local garages. Motor trucks and lorries are coming into general use for transport purposes, and there would appear to be a great future for this class of vehicle in China.

New American Steam-Driven Motor Cycle

From time to time, experimental steam-driven motor cycles have made their appearance, and so the use of steam as a method of propulsion is by no means new. It is interesting to note therefore that an American, named Longford, has produced a "gearless, beltless, chainless and noiseless steam-driven motor cycle," which is expected to sell at a lower price than that of the average petrol-driven machine.

The machine runs on kerosene, which generates the steam, and a consumption of 45 m.p.g. of kerosene and 55 m.p.g. of water is said to have been obtained. The boiler of the machine is of the semi-flush type. There are two $2\frac{1}{2}$-in. by 3-in. cylinders attached one on each side of the rear wheel, giving a direct pull without any loss of power. The engine is capable of developing 300 r.p.m., and 2,000-lb. pressure can be applied to the rear axle crankpin by opening the throttle to its fullest extent.

Good Roads in China Affect all Countries

THERE is to-day not a nation in the world with any commercial or industrial development worthy the name, that is not vitally interested in China. This is because of the 400,000,000 Chinese people, who form a potential market of tremendous purchasing power for all manner of goods.

Practically the only market in China of immediate value to the foreign exporter is in the large coast cities, Peking, Hongkong, Shanghai, Canton, etc. The development of the interior has been retarded by the lack of means of transportation and communication. Without good roads, permitting commercial intercourse between the coast and the interior, the century-old ideas and idiosyncrasies of the Chinese cannot be overcome.

Good roads are therefore a fundamental and primary requisite for the economic development of China. This has been poignantly brought to the attention of the civilized world during the famine of the last year. In many instances food rotted at railway terminals, while at a distance of 50 to 100 miles hundreds and even thousands of people starved, because there were no means of transporting the food to them, and no roads. The afflicted region, with a population of 45,000,000, is impenetrable to all except the most primitive forms of cart and wheel-barrow transportation.

The American Red Cross is engaged in the construction of roads to make use of the famine labor in the stricken territory. One of these roads, in the province of Shantung, will be nearly 100 miles in length. At present the total mileage of metalled roads in China does not exceed that figure.

Natural conditions in China are favorable to the building of roads. There are no torrential rains to wash away the subgrade and undermine foundations; and there are no long periods of frost except in the extreme north. Furthermore, the materials necessary for road building are available in the country itself.

There are two chief obstacles in the way of road building in China—national poverty, partly real, partly due to corrupt officials; and that individualistic trait in the Chinese character, strengthened by the keen competition for existence, which prevents co-operative effort to further movements for the common welfare.

There is, however, encouragement in the fact that the past two years have witnessed the beginnings of what will some day be a national movement for good roads. The first important road in China was built by the American Red Cross several years ago, from Peking to Tungchow, to relieve the victims of a flood in North China. As a direct result of this work sporadic road building projects have sprung up, notably in the Tientsin and Shanghai districts. Other projects of a similar nature are in contemplation.

The merchants are the most progressive element in China and the hope of good roads lies largely in their hands. Fortunately, they are beginning to display considerable interest in the matter, and this interest must be encouraged by foreign manufacturers, especially manufacturers of motor cars and trucks.

Public opinion is perhaps a more potent force in China than in any country in the world. For that reason, the education of public opinion to the value of good highways is essential. The greater the number of Chinese who own motor cars and trucks, the greater will be the demand for roads.

Nothing can be expected at the present time from the Chinese government at Peking, on account of the instability and poverty of that organization. The suggestion that foreign manufacturers, especially motor car manufacturers, make loans to the Chinese government for the purpose of road building is not feasible for the reason that the control of the central government over the various provinces is not well enough defined, and the result would probably be a waste of the funds thus made available.

Under the consortium of foreign powers great progress in the building of national highways should be made. Herein lies the greatest immediate hope of such projects. Public opinion, built up and made active through the extensive use of motor vehicles, should insure the continuation of road building by the Chinese government, once the latter is firmly established.

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

Type	To-day's Price	Price Jan., 1921	Reduction
2-2½-ton Standard Lorry Chassis...	£730	£ 997	£267
2-2½-ton Long Char-a-bane Chassis	£750	£1,007	£257
3½-4-ton Lorry Chassis	£865	£1,195	£330
3½-4-ton Char-a-bane Chassis ...	£880	£1,190	£310
4-ton Long Wheelbase Omnibus Chassis	£950	£1,200	£350
5-6-ton Lorry Chassis	£960	£1,320	£370

The prices given above are F.O.B. Guildford, England

WITH a view to stimulating trade and maintaining employment, we have written down our Stocks to a figure very much under cost, and this, with the wages reductions that will take place in the near future, has enabled us to sell our Chassis as from October 1st at the prices mentioned opposite.

Purchasers of "DENNIS" vehicles, even at such low prices, can feel perfectly assured that they are acquiring absolutely new goods of latest and most improved construction, as Dennis Brothers have never purchased or taken back second-hand War Lorries. The Vehicles we are offering are absolutely new and embody improvements on previous models. We have been able to keep our factory busy on new productions, and are not selling Chassis made two to six years ago and re-purchased from the Government, nor are we offering re-conditioned War Chassis.

WRITE FOR PARTICULARS:—

Agents:

Messrs. Wearne Brothers, Ltd., 310 Orchard Road, Singapore.
Messrs. Perrin Cooper & Co., Consular Road, Tientsin.
Messrs. Central Garage Co., 9 Hongkong Road, Shanghai.
Messrs. Alex Ross & Co., Ltd., Machinery Department, Hongkong.
Messrs. Fikkert Motor Car Co., Weltevreden, Batavia.

Cables: A.B.C. 5th Edition, Lieber's, Bentley's, Marconi.

DENNIS BROS., LTD.

GUILDFORD, ENGLAND

D 221

The Gleniffer

MESSRS. Gleniffer Motors, Ltd., manufacture four-stroke marine motors of the paraffin type though they also build them to run on petrol only if desired. The engines which they are at present manufacturing have all been designed within the past two years. The aim of the designer has been to produce an engine which will be as far as possible fool-proof and require as little attention—and especially skilled attention—as possible. At the same time it should be able to run for extended periods without the necessity of an overhaul.

Two series of engines have been designed, one series having cylinders 4½-in. bore by 5-in. stroke and made in two, four and six-cylinder models, and the other series having cylinders 6-in. bore by 8-in stroke, made in one, two, four and six-cylinder models. The 4½-in. by 5-in. paraffin engines develop 12, 24 and 36 B.H.P. and the petrol engines 14, 28 and 42 B.H.P. The 6-in. by 8-in. engines develop 12½, 25, 50 and 75 B.H.P. on paraffin and 15, 30, 60 and 90 B.H.P. on petrol. The normal speed of the 4½-in. by 5-in. series is 800-1,000 R.P.M. and of the 6-in. by 8-in. series 600-700 R.P.M.

All corresponding parts in the different models of each series and made interchangeable, even such parts as the reverse gears, governors and water pumps (the strokes of which are altered by fitting different eccentries) are the same in all engines of the same series, and all the main bearings are alike and interchangeable with the big end bearings. By this means quantity production of all the smaller parts can be attained at the same time as offering a fairly large selection of models and thus also can the cost of production be lowered.

The line drawing shows the details of construction of the 24/28 H.P. four cylinder 4½-in. by 5-in. engine and reverse gear, which shows the general design of the complete range of engines manufactured by the firm.

The cylinders except, of course, in the single-cylinder model, are cast in pairs, having detachable heads and inclined valves operated by rocking lever tappets with rollers running on the cams.

The compression joint on the head is made by a copper and asbestos gasket and the water joint by rubber rings. These rubber rings prevent the water coming in contact with the asbestos or copper of the gasket which thus overcomes the chief difficulties connected with detachable heads. It also facilitates the detaching of the head, which is done by merely disconnecting one outlet water connection and the holding down nuts. Inspection and cleaning doors are fitted on each end of the water jacket. The detachable cylinder head is so arranged that the piston and connecting rod may be removed for inspection through the top of the cylinder without moving the cylinder itself. The gudgeon pins are located in the pistons by a contracting spring steel ring in a groove round the piston. The connecting rods are of conventional design. The big-end bearings are die cast white metal bushes housed in steel keeps and are interchangeable with the main bearings which latter are mounted on the bottom half crank case.

The reverse gear is incorporated in the fly-wheel at the after end of the engine and is entirely encased within the crank case, with the result that the outfit takes up very little space fore and aft, and gives a particularly clean appearance. A unique system of lubrication is employed, the oil being thrown by the fly-wheel from tle sump into an oil-collecting chamber in which are placed small buckets which catch the oil; from there it is led by gravity through large bore copper pipes to cups above each main bearing. The overflow from these cups supplies the troughs in the bottom of the crank case from where it is splashed by dippers on the big ends to all the remaining working surfaces of the engine. The reverse gear, being in the after end of the crank case, is, of course, running in oil. This lubrication system is thus entirely automatic and fool-proof. In the larger sizes of engines the lower portion of the base chamber is water jacketted for its entire length thus keeping the lubricating oil at a moderate temperature.

In order to reduce the work entailed in running the engine and to reduce the chances of ill-usage all moving parts in the engine, with the exception of the water pump eccentric, are enclosed within the main crank case and are lubricated from the splash caused by the connecting rod dippers. The oil which works out along the pump driving spindle is fed into the eccentric, thus rendering the automatic lubrication complete.

It might be thought that a totally enclosed engine would be very inaccessible, but this is not the case in these engines. Exceptionally large doors are fitted on each side of the crank case which are amply large enough to enable spanners to be manipulated with ease, and also to examine, adjust or replace main or big end bearings. Large doors secured by finger-screws are likewise fitted to the chambers in which the valve spindles and rocking levers operate. From these chambers is drawn a proportion of the air which supplies the vaporizer. This maintains the circulation of oily air into these chambers and at the same time prevents all leakage of foul air from the crank case into the engine room.

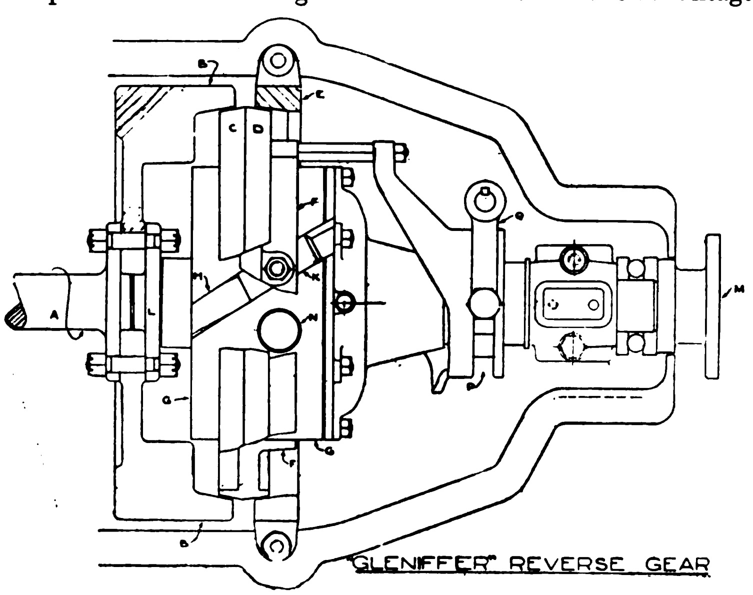
The paraffin vaporizer is of the exhaust heated type and is ingeniously arranged to make use of a physical property of the fuel which completely overcomes the difficulty of vaporization when running for prolonged periods at dead-slow speed.

The temperature at which paraffin can be completely vaporized is dependent to a considerable extent on the pressure at which the vaporization takes place. The lower the pressure is, the lower will be the temperature necessary to cause vaporization.

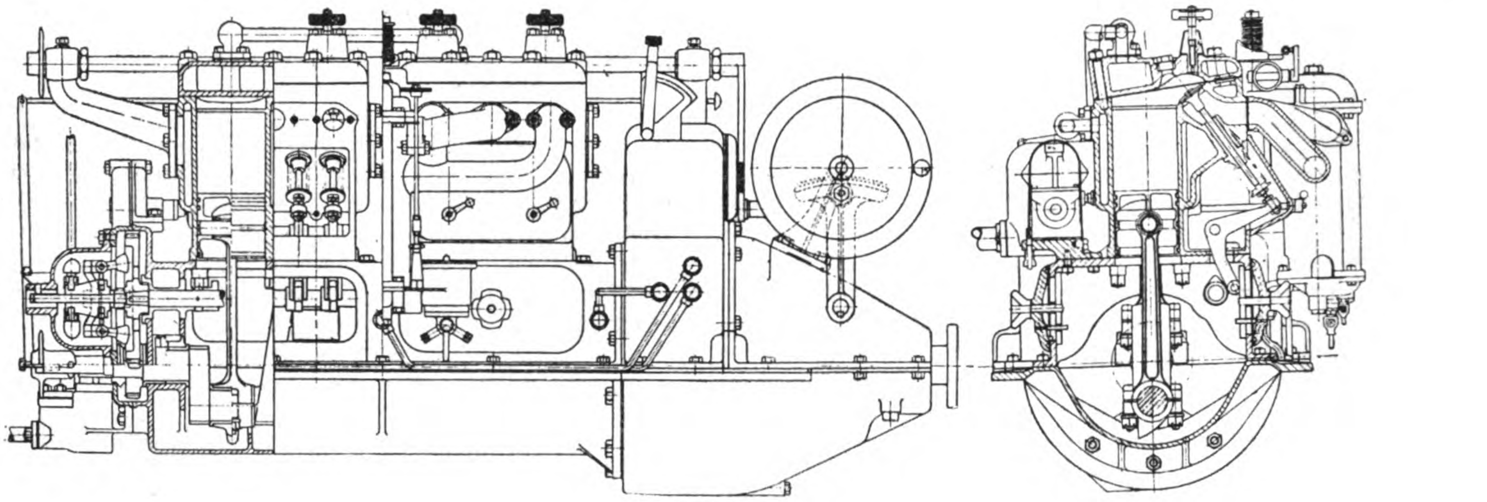
In a throttle-controlled engine running on no load or dead slow a partial vacuum is formed between the throttle and the cylinder. This reduction of pressure amounts to as much as 7 to 8-lb. per square inch when an engine is "ticking over" or in other words the pressure in the inlet pipe is about one-half the atmospheric pressure.

In order to take advantage of these properties of the fuel the throttle is so arranged in this vaporizer that the fuel is subjected to the above-mentioned partial vacuum throughout the period of its carburation and vaporization.

The arrangement of the parts of the vaporizer are as shown in the diagrammatic line drawing in which C is the throttle which controls the whole supply of air entering the system. Part of the air passes down the passage L where it is heated by contact with the wall of the exhaust heated chamber. It then passes up through the choke tube F drawing with it a supply of fuel from the jet G, and continues through the exhaust heated tube M, and so to the engine. An



"GLENIFFER" REVERSE GEAR
(PATENTED)



automatic air valve D is fitted which is controlled by the spring A to which a tensioning device is fitted (not shown in the diagram). A dash pot B is also fitted to prevent violent movements of the valve. The valve H is used to control the flow of fuel from the float chamber through the passage K to the jet G. It is essential that the pressure on the fuel in the float chamber should be the same as the air before passing through the choke tube. For this reason the passage E is necessary.

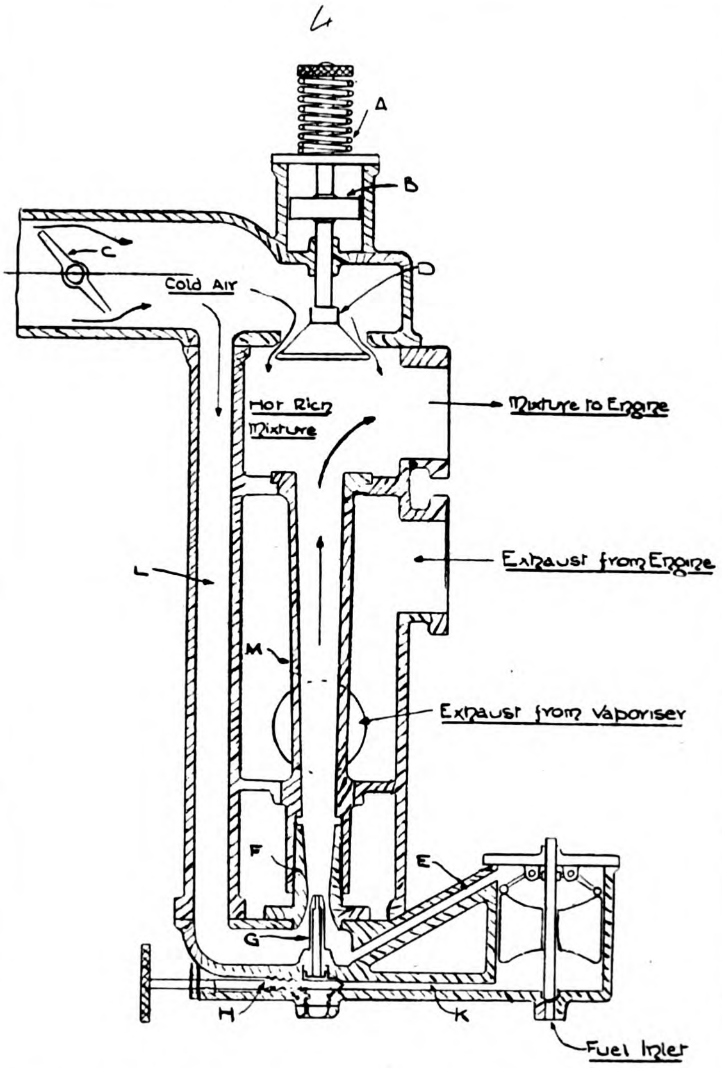
When the engine is running on full load only a small proportion of air passes down the passage L which forms an excessively rich mixture at the choke tube. This rich mixture is heated to a high temperature in the tube M which completely vaporizes the fuel. The mixture is then diluted to the correct strength by pure cold air from the valve D and passes to the engine at a moderate temperature. When running dead slow the valve D is closed automatically and all the air passes the choke tube where it draws only sufficient fuel from the jet to make a correct mixture, this passes through the heating chamber M which is now at a much lower temperature than when running at full load, but owing to the partial vacuum in the system complete vaporization still takes place.

The vaporizer is initially heated by running the engine for 3 minutes, on petrol after which it will run on paraffin, or it may be initially heated by a blow-lamp. When the engine is hot it will start on paraffin without the use of petrol. This may be done as late as 1½ hours after stopping. A centrifugal governor acts directly on the throttle and the speed at which it governs is controlled by a hand lever.

The Gleniffer patented reverse gear depends for its action on a principle which is a completely new departure for this class of mechanism.

The working of the gear may be followed by reference to the line drawing, in which A is the after end of the crankshaft, B is an extension of the fly-wheel rim, the inner surface of which forms the ahead driving clutch, and C is the corresponding driven member. E is a stationary clutch member which engages with D. C and D form one part with the sleeve F which is a sliding fit on the drum G and is constrained to move along this drum in a helix by means of the keyway H and the key K, this key being secured to the sleeve F. Within the drum G is contained an ordinary bevel epicyclic train of wheels. The driving wheel is keyed to shaft L and the driven wheel to shaft M. These are two intermediate pinions supported on pine N secured to the drum. The gear is operated by the lever Q acting through the collar P by means of which the clutch sleeve C D F may be moved into engagement with either B or E. The gear as shown is arranged for an engine, the shaft of which revolves as shown by the arrow on the shaft A.

When the clutch member C is brought into engagement with member B the member B tends to drive it in the same direction as the arrow, this in turn forces the key K against one side of keyway H and causes a longitudinal thrust which thrusts the clutches firmer together. This thrust is proportional to the torque transmitted and maintains the clutch members C and B in contact with sufficient force to transmit the power of the engine. As soon as a force is applied pulling the clutches apart, by means of the operating gear, the force of contact between the clutch members is reduced and allows slipping to take place and the clutch offers no further



"GLENIFFER" VAPORISER

(PATENTED)

resistance to disengagement. When the clutch members C and D are in mid position, *i.e.*, in neutral the driven shaft M is stationary. At the same time the drum G is idling round. To obtain the reverse motion the clutch member D is engaged with the stationary member E. A longitudinal thrust is now produced by the keys in the helical keyways which maintains these two clutches in engagement in an exactly similar manner to the ahead clutches. By this means the drum G is brought to a standstill and the action of the bevels is to give an astern motion to the shaft M, which revolves at the same speed as the engine.

It will now be seen that the operating gear is only necessary to engage or disengage the ahead or astern clutches. As soon as either of them is engaged the torque of the engine holds it in engagement. It will also be observed that any wear which takes place on the clutch surfaces will not affect the working of the gear, which requires no adjustment whatsoever. The operation of the gear is very simple and sweet in action. This gear is entirely independent of propeller thrust for engagement of the clutches thus eliminating the difficulties experienced in gears of that type in which the thrust varies inversely with the boat speed for a given power of engine. It also eliminates the inavoidable force and aft movement of the propeller shaft that is inherent to that type of gear.

Singapore Exhibition Diploma Award to Gleniffer Motors

One of the features of the marine side of the Malaya-Borneo exhibition held recently at Singapore was the exhibit of Messrs. Ritchie & Bisset who are sole agents for Malaya for Gleniffer Motors, Ltd., Anniesland, Glasgow. Their exhibit obtained first mention amongst the few diplomas awarded for imported marine machinery.

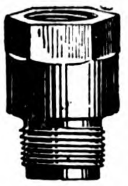
On show was one of the new model K2 engines fitted with glass crankcase and flywheel casing doors, and fixed on bearers having a rake of 1 in 7. Electric lights were fitted inside the crankcase. This engine was driven by an electric motor and belt and the most efficient lubrication by Gleniffer's patent system was shown in operation. Near at hand was one of the model L.10/12 H.P. engines, also one of the new M.4 24/28 H.P. engines complete with all the standard outfit. The latter engine should prove very popular with Far Eastern buyers. A demonstration reverse gear and a sectional vapouriser—both being Gleniffer's latest patents and fitted on all new models—were also on view, and, together with a selection of spare parts, made a very interesting show.

Also on exhibit was a 25-foot teak motor boat fitted with a model L.10/12 H.P. engine. The hull was built in Singapore by Chinese workmen and is a fine example of the local boatbuilder's art.

Increasing Spark Plug Efficiency

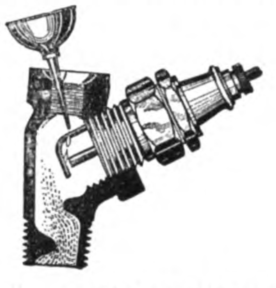
IGNITION trouble is one of the most common causes of annoyance to the motorist. Engineers are constantly endeavoring to invent means of eliminating all defects in motor construction that prevent a regular and efficient sparking. A device designed to accomplish this result, and being placed on the market by the Gemco Manufacturing Company, Wisconsin, is the Baf-Oil Plug.

$\frac{1}{2}$-inch Size Plug

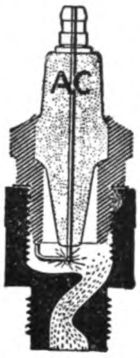


$\frac{7}{8}$-inch Size Plug

The plug consists principally of a combustion chamber into which the spark plug is screwed in the usual manner. There are two baffle plates in each chamber which prevent the oil from reaching the firing points. Each plug is a complete unit in itself and has no mechanical contrivance to wear or get out of order. The illustrations show clearly the operating principle of the device.



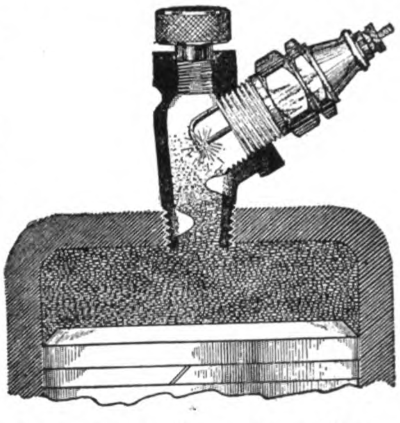
Showing Method of Priming



Cross Section of Plug

In addition to keeping the oil from reaching the firing points, the baffle plates, becoming extremely hot while the motor is in operation, act as hot spots which it is said completely vaporize the gasoline. When the spark occurs, the vaporized gasoline in the combustion chamber ignites and enters the cylinder proper, causing a clean explosion, increasing the power of the motor and reducing carbon deposit.

The Baf-Oil Plug is made in two sizes, $\frac{1}{2}$-inch and $\frac{7}{8}$-inch. A priming feature is included in the $\frac{1}{2}$-inch size which is highly desirable, especially in cold weather.



Complete Installation of Baf-Oil Plug

Tokyo's Revised Automobile Tax Schedule

(These Rates Became Effective April 1st)

Classification:	1922 Prefectural Tax	1922 Regular City Tax	1922 City Planning Special Tax	1922 Total	1921 Prefectural Tax	1921 Regular City Tax	1921 City Planning Special Tax	1921 Total	Reduction as compared with Last Year
Personal Use.									
20 H.P. or more	Y.255.00	Y.469.20	Y. 63.75	Y.787.95	Y.300.00	Y.543.00	Y.120.00	Y.963.00	Y.175.05
15 H.P. or more	200.00	364.00	50.00	614.00	210.00	388.50	84.00	682.50	68.50
10 H.P. or more	131.00	241.04	32.75	404.79	131.00	247.59	52.40	430.99	26.20
5 H.P. or more	79.00	146.15	19.75	244.90	79.00	150.10	31.60	260.70	15.80
Less than 5 H.P.	44.00	84.04	11.00	139.04	46.00	89.24	18.40	153.64	14.60
Commercial Use.									
20 H.P. or more	Y.120.00	Y.220.00	Y. 30.00	Y.370.80	Y.150.00	Y.271.50	Y. 60.00	Y.481.50	Y.110.70
15 H.P. or more	86.00	156.52	21.50	264.02	107.00	197.95	42.80	347.75	83.73
10 H.P. or more	60.00	110.40	15.00	185.40	67.00	126.63	26.80	220.43	35.03
5 H.P. or more	40.00	74.00	10.00	124.00	41.00	77.90	16.40	135.30	11.30
Less than 5 H.P.	24.00	45.84	6.00	75.84	24.00	46.56	9.60	80.16	4.32

The above automobile tax rates are those which will be effective in Tokyo for the remainder of the present year, the old levies having been revised to take effect April 1. This chart shows in detail the new rating for each classification of car, both in its component parts and in total, as well as the old rates. The last column gives the amount of reduction which has been made for each class of machine.

General Motors Opens Largest Office Building in the World

THE new General Motors building in Detroit, Michigan, U.S.A., which has been in the process of construction for the past two years, is now practically completed. Already, half of the offices are occupied, and the entire building is the scene of ceaseless activity.

Fifteen stories in height, covering an entire city block, with a total floor space of 1,200,000 square feet, and containing approximately 2,500 offices, this single building, said to be the largest office structure in the world, will, when present plans have finally been carried out, house no less than 6,000 office workers—a number sufficient to support a population of 30,000.

The main floor, with its great show rooms, is intended for the display of General Motors products. Ultimately, it is going to be an all-year automobile show, and will be brilliantly illuminated every night of the week. At the present time, Buick, Chevrolet and Oakland cars are displayed there, and within a short time all the other important units of the General Motors lines will be quartered in the same building.

On the ground floor, there is a large auditorium, seating 1,500 persons, and equipped with a stage and other complete appointments. This will be available for meetings and assembly purposes of all kinds.

The second and third floors are devoted to general office use, and already representatives of the spare parts and accessory manufacturers serving the automobile and allied trades are filling up the offices to such an extent that the building promises to be a real headquarters for this particular division of the motor industry. Twelve floors will be reserved for office space for the General Motors Corporation, and its affiliated companies. The building will also contain a bank, railroad ticket offices, and telephone and telegraph stations.

Adjoining the main building are the engineering laboratories, devoted to part of the important research activities of the General Motors Corporation. These are in one building 500-ft. long and 60-ft. wide, and equipped with the most highly developed apparatus for testing manufactured units in all stages of production. An independent power house with a reserve capacity sufficient to meet all possible demands is connected with the main building by a tunnel 368-ft. in length.

The General Motors building is located at the geographical centre of Detroit, near the intersection of two main arteries of street traffic. Already, its opening has stimulated the growth of business in its vicinity. Anticipating the future growth of Detroit in this direction, this new building has been built to endure for 100 years or more.

French Road Builders Announce New Methods

The French, ever to the fore in matters of highway development, have just announced a new type of highway, which gives promise of solving some of the difficult problems of those who build roads. The surface of the road is composed of a new material compounded of concrete, iron and cement. The first completed section of this type of construction was recently inspected by French, British, Belgian and American highway engineers and the chorus of unqualified praise augurs well for the future.

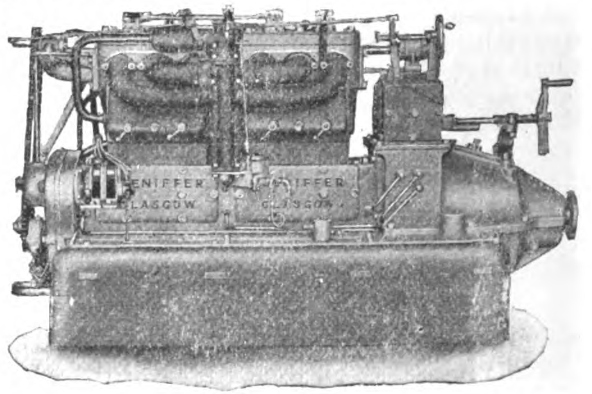
In construction a great trench is first constructed and in this a layer of concrete is placed, approximately five inches thick. On top of this is placed another layer of pure cement of the same thiskness. In the cement are placed large iron studs, 25 to the square yard. This mass is then covered with a layer of fine concrete, which is laid on before the cement below is quite dry. The whole is then thoroughly cured by the water process and the result is claimed to be the best road seen in Europe since the highway builders of the Roman empire threw up their job.

A New Air-Cooled Motor Cycle Engine

THE design of engines for motor cycles presents many problems of interest to the engineer and of great importance to the manufacturer. Simplicity, robustness, reliability, smoothness of running, efficiency, and many other qualities have to be combined in a machine which must in the end be cheap. Mainly because of this last factor, many refinements employed in the motor car engine cannot be adopted in the motor cycle engine. Such conditions offer a clear stimulus to the skilful designer, and a new type of engine produced by a British firm marks a considerable advance towards the ideal. It is an air-cooled motor-cycle engine with sleeve valves. Hitherto the use of the sleeve valve in any type of motor car engine has been looked at a little askance, owing to expected trouble with lubrication and cooling. These troubles are not encountered in the numerous examples of automobiles fitted with sleeve-valve engines; and their success has led this firm to adopt the sleeve valve in an air-cooled engine—the first time this combination has ever been attempted. One great advantage of the sleeve valve is its silent action, the public will be grateful for any reduction in the noise made by motor cycles. The new engine has a single cylinder and gives a nominal output of 3 horse-power, but it can give a much higher power than this over-long periods. As much as 7 horse-power is produced at 7,000 revolutions per minute. Its total weight is only 50-lbs. The number of parts in the engine is much less than in the ordinary type, and every detail is first-class in material and workmanship.

To aid the motorist to give intelligent care to his tires, the technical service department of the United States Tire Company has prepared a number of folders of specific technical information. Folders issued to date are entitled "Nomenclature," "Flaps" and "The Use of 31 by 4 Tubes in 30 by $3\frac{1}{2}$ Clincher Cord Casings." Other folders will be published as the need arises.

GLENIFFER
KEROSENE & PETROL MARINE MOTORS



FOR ALL TYPES OF BOATS
RANGE OF MODELS 10 TO 90 H.P.

AGENTS:—Douglas and Grant Ltd.—at Madras, Rangoon, Bangkok, Saigon, and Haiphong.
Ritchie and Bisset—at Singapore.
British and Dutch Engineering Co., Ltd.—at Batavia and Soerabaia.

GLENIFFER MOTORS LTD.
ANNIESLAND, GLASGOW, SCOTLAND.
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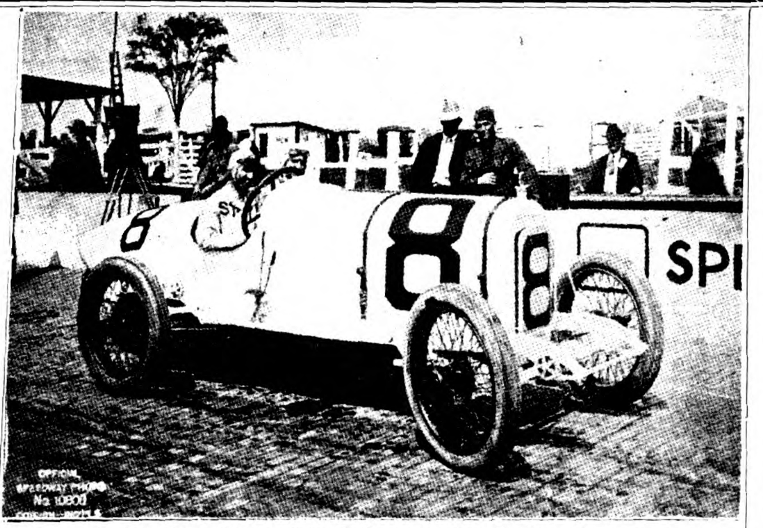
Graphite Transmission and Differential Grease No. 677

We are proud to state that No. 677 has justified the labor and expense devoted to a really intelligent effort to produce an ideal gear lubricant. It has successfully stood the test of years. There is nothing like it on the market. It is the grease the "Speed Kings" use.

No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



"Dixon's Graphite Automobile Lubricants are about as necessary to a racing car as gasoline. I like their kind of lubrication for my cars."—EARL COOPER

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22 KIUKIANG ROAD

SHANGHAI, CHINA

Graphite Cup Greases

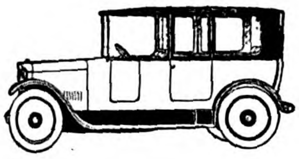
Cup Greases containing fine flake graphite reduce friction to a minimum. By using these high-grade graphited greases, bearings soon acquire the well-known graphite polish that eliminates friction and causes easy running. Use in all grease cups, wheel spindles, etc.

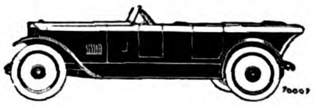
Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

Sold in one, five and ten pound tins. Larger packages if desired.

BENZ





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Manila's New Automobile Tax

THE following are the principal provisions of the new Manila automobile tax law which went into effect recently :—

Exemption from license is granted to automobiles and trucks belonging to the United States, insular, provincial and municipal governments ; those not regularly kept and used in the city of Manila, and those for personal use of the consular representatives of foreign nations.

On each passenger vehicle an annual tax shall be paid as follows : Twenty-five centavos for each horse power, one centavo more per kilogram, gross weight, for each vehicle equipped with solid or pneumatic tires, and two centavos additional for each kilogram of gross weight of the vehicle and load when equipped with metal tires. All vehicles for rent in the streets or plazas or in garages and other places for public hire, also all cars registered by the bureau of public works in classes "H," "G" or "P.U." shall pay double the above taxes.

Gross weight for a passenger vehicle means its actual total weight, loaded, calculating 70 kilos for each passenger.

All motor trucks, whether used for cargo or passengers, shall pay a tax of P.40 for the first ton capacity and one centavo for each additional kilogram capacity.

Trailers of less than two metric tons capacity must each pay P.10 annually and those of larger capacity P.20 annually.

Motor cycles without side cars are taxed P.3 a year, and those with side cars P.5.

If original application for license comes between January 1 and March 30, the full year's tax shall be paid ; if application is made in the second quarter, only three-fourths of the annual tax shall be paid ; if in the third quarter, one-half of the tax is assessed ; and during the last quarter, only one-fourth of the annual tax will be required.

All the money collected from this tax goes to the fund for the construction and repair of the streets of Manila.

Fines for violation range from P.25 to P200, inclusive.

Siam's Motor Imports

According to the department of overseas trade report on the commercial situation in Siam, motor cars (six) at a value of ticals 35,090 (£3,110) were imported from the United Kingdom and ninety-five valued at ticals 377,787 (£33,491) from the United States.

Motor car parts to the value of ticals 116,434 (£10,322) were imported from the United States. From these figures it will be gathered that there is room for more business in the line in his majesty the king of Siam's dominions.

Motor Trucks in Japan

Although the Japanese government encourages local manufacture of motor trucks by granting a bounty for cars built according to military specifications, output does not meet demands. United States exporters are busy in Tokyo and Osaka, where exists the most promising outlet for such vehicles. Widened roads and strengthened bridges are expected to create a demand in the smaller cities and country districts.

Entrusted with a mission of propaganda through the United States of America, General Diaz, head of the Italian army, met with an enthusiastic reception wherever he passed. The object of the mission was to bring home to the American people the efforts of the Italian nation towards the securing of victory in the great war, and the desire of this people to help forward universal peace.

Naturally the motor car played its part in the demonstrations of the American people, for whereas in the Old World an official procession is made up of carriages drawn by prancing horses, in the United States the motor car only is used to carry distinguished visitors through the city streets. Picturesqueness was added to these scenes by the presence of Italian soldiers in full uniform, with mounted American police acting as a guard of honour.

Humber

Cars of Comfort and Refinement

THERE is a general consensus of opinion among motor experts and owner drivers that a Humber Car is typical of all that is best in motor car d°sign and construction. Indeed we have contrived to put into every model an engine with wonderful flexibility and acceleration, a thoroughly sound well-balanced chassis, and a body the comfort and refinement of which contribute in no small measure to the Humber reputation.

Full Particulars Sent on Request.

HUMBER LIMITED

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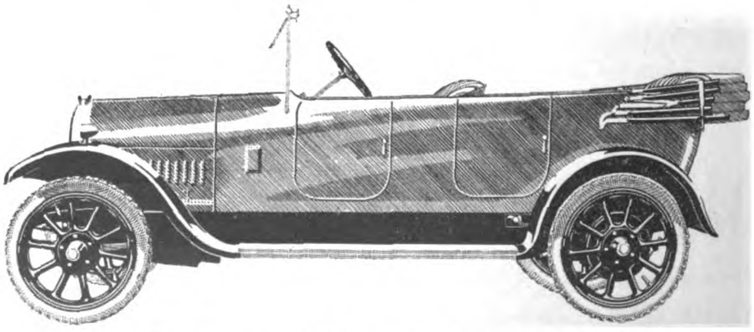
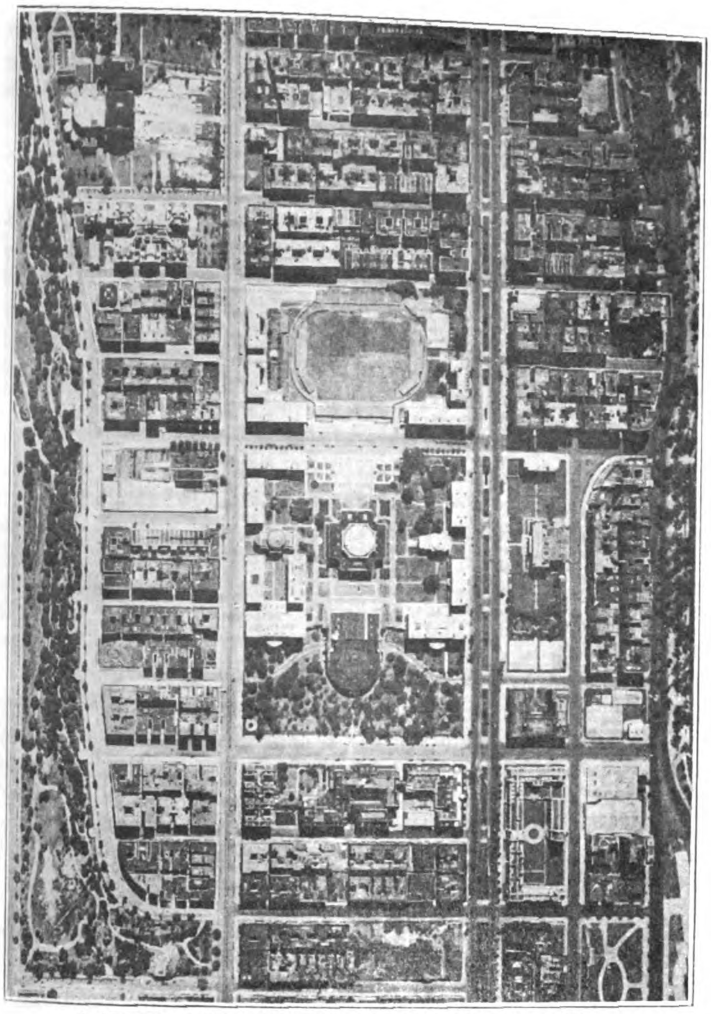


Humber 11.4 H.P. Four-Seated Model

Aerial Photography



A SECTION OF THE NEW YORK MOSAIC MAP

It is the Morning-side heights district. The white circle in the centre is the dome of the Columbia University Library. Just below may be seen the south field. In the lower right-hand corner may be seen the St. John's Divine. Note the seven chapels at the right and at the left the foundation of the uncompleted Cathedral. Along the right side of the picture may be seen the Morning-side Park and in the extreme upper corner Grant's Tomb. This view is one of the one-hundred vertical photographs that go to make a complete Mosaic of Manhattan Island. The view is a permanent record made by one flash of the shutter.

AMERICA has added another important invention to her rapidly increasing number of distinctive achievements in aviation.

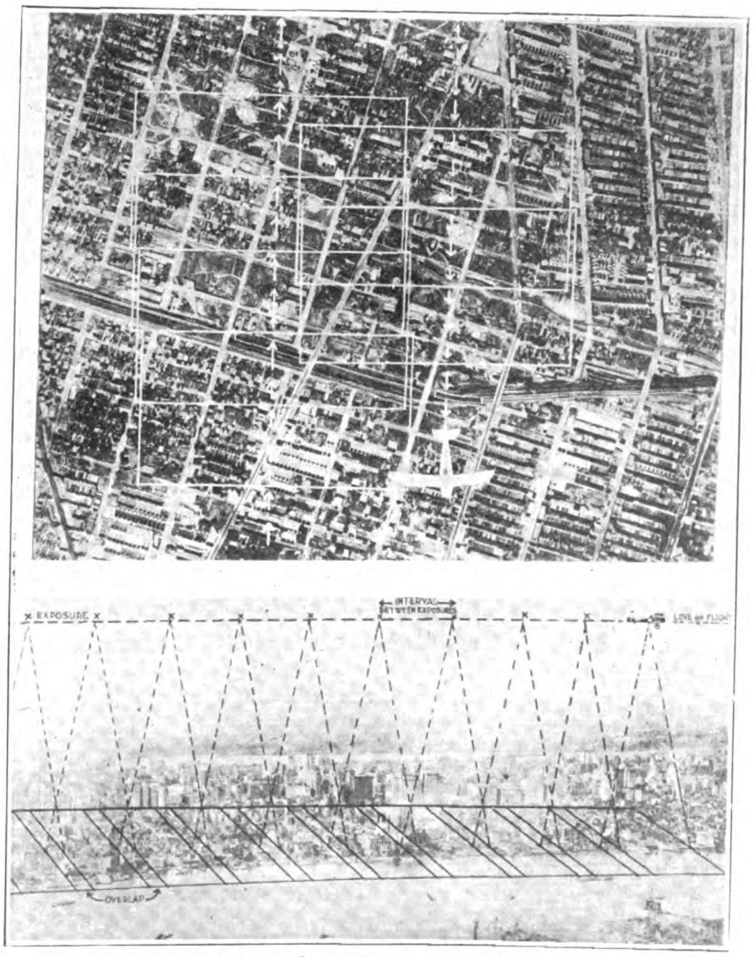
It is the perfected aerial camera which has just given a remarkable demonstration of efficiency in a photograph of New York city from the air. Municipal engineers say it will save many thousands of dollars and years of engineering work in effecting public improvements. The photograph is more than 8-ft. long and 20-in. wide. It shows more than 32 square miles of the metropolis, every street, building, vehicle and person out of doors, just as one would see it looking down straight upon it from a position high overhead.

The machine which made the photograph possible is a big camera with several new devices invented by Sherman M. Fairchild, president of the Fairchild Aerial Camera Corporation, 136 West Fifty-second Street, New York. His experiments the last three years have been directed toward making the camera accurate and economical, the main essentials in practical commercial photography, particularly aerial maps such as that of New York.

Inaccuracy has been the chief difficulty with various kinds of apparatus employed heretofore. Many technical problems were overcome by the Fairchild inventions which so improved the mechanism and actual work of this new camera that the results were better than 99 per cent. accurate—more than sufficient for all practical purposes, according to municipal officials and engineers and those of large corporations who see in this development limitless possibilities for saving time and money in many branches of their work.

The New York photograph is a vertical one; that is, it was taken from an airplane flying directly overhead, and is known technically as a mosaic; or aerial map. Using a film similar to the ordinary camera, though larger, and regulating its exposure by means of an electric timing device gauged to the relative speed of the airplane from which the camera was operated, Fairchild succeeded in removing the hundred and one difficulties which have delayed commercial progress in this kind of mapping.

Plotting the city into rectangular sections of a scale so that each section could be photographed individually from the plane right over its exact centre, the entire city from the Battery to Van Cortlandt Park was divided into 100 parts. Each of them was photographed. The hundred photographs were taken in a single flight of 69 minutes. As the plane passed over the centre of each rectangular section there was an automatic click of the camera, and the film automatically rolled into position for another exposure a few seconds later. When the sections had all been "snapped," Fairchild had 100 photographs, all together totaling an area of approximately 32 square miles. They were then fitted together like a picture puzzle and mounted on cardboard—and there lay New York, with everything out of doors plainly visible and accurate in size and location.



A diagram showing how thrty-two square miles of New York was plotted and photographed in sixty-nine minutes with a modern aerial mapping camera. Above is a plan of the area. Below is a cross-section diagram showing the method of procedure.

Effect of Tropical Climates on Airplanes

IN a lecture before the Royal Aeronautical Society (England) Air-Commodore H. R. M. Brooke-Popham, vice chairman of the society, gave an interesting description of the new desert route between Cairo and Baghdad. He also dealt with the various difficulties to be overcome in flying airplanes in tropical climates. He expressed the opinion that machines built, as at present, of wood are satisfactory so long as they are only to be flown in Egypt or Mesopotamia ; but when it comes to machines flying regularly between England and these countries metal construction will probably be necessary. Shrinkage of timber as a result of the climate he considered more of a nuisance than a danger, but he thought it desirable that wings should be sent out from England uncovered with fabric, as in any case they have to be stripped on arrival for adjustment of internal fittings. Conditions are a good deal worse in Mesopotamia than Egypt, chiefly owing to the very great changes in temperature and humidity of the atmosphere during the day. In the desert there are sudden changes in the direction of the wind, which are very disturbing. On one occasion, just after midday the wind kept changing from east to north and back again in a few seconds. Two hours later it had completely died down, while five minutes later it was blowing steadily from the West. Wastage in propellers is high, from splitting owing to heat and damage from small stones. Tires were another big item in upkeep, and petrol constituted a heavy expense owing to evaporation and the carelessness of native labor in handling the container. Provided that extra radiators are fitted there does not appear to be much engine trouble specially due to the climate either in Egypt or Mesopotamia.

Hopping Off the Cliff

A CONTRIBUTOR to *The Motor* (South Africa) states that, according to stories told by the natives of Hawaii, all the thrills of flying were enjoyed by the Hawaiians centuries ago. Their ancestors secured their aerial excitement by jumping off cliffs into the sea in home-made airplanes. They made a regular game of it, known as "lele pali," or "jumping from the cliff." It was played up to a hundred years or so ago by natives who lived near groves of loulu palms, near high cliffs overlooking the sea. The game was played with large contrivances built of light but stout sticks and overwoven with loulu palm leaves. Several of these affairs were made ready, the Hawaiian "aviators" took their seats and were pushed over towering cliffs. The adventurer who remained longest in the air was the winner. Frequently an airplane, owing to the carelessness or over-excitement of its "pilot," executed a nose dive after the fashion of the twentieth century machines. The only damage was the loss of the game. Old Hawaiians say that their flying men were exceptionally skilful. The only means they had of guiding their crude appliances was to shift their weight to maintain balance as they zigzagged down toward the sea. A fleet of outrigger canoes was anchored off shore to pick up the sportsmen and retrieve the "planes." Exceptionally daring Hawaiians, it is said, often hopped off thousand-foot cliffs on the mainland.

Progress of Civil Aviation in Great Britain

IN a memorandum on the development of civil air communications within the British Empire, prepared by the department of civil aviation, it is stated :

"The development of communications is one of the most important phases in the growth of modern civilization, which depends to an ever-increasing extent on the interchange of thought and the intercourse of individuals. Steam, cable and wireless have each in turn been evolved to expedite intercommunication, but just as the roads of the Roman empire failed to keep pace with the requirements of the time, so modern communications are insufficient for an empire stretching from Great Britain to Australia and the Pacific Ocean. Cable and wireless are limited in scope ; yet, as each portion of the empire assumes greater responsibility, there is a greater need for co-operation, the distribution of information, and the personal contact of statesmen. That necessity is the mother of invention is a motto particularly applicable to modern conditions, and by discovering how to fly human ingenuity has taken a further step in solving the problem of communication so essential to the existence of our empire.

"Civil aviation aims at the building up of a productive organization to a position similar to that held by our mercantile marine."

Non-Stop Flight Competition in Japan

The fourth non-stop mail flight, open to civilian aviators, held under the auspices of the Imperial Aviation Society on November 3rd, was participated in by six entrants, only two of whom covering the prescribed distance of 362.5 from Kanazawa and Hiroshima. The planes used were either made in Japan or reconstructed from foreign planes. Neither of the two successful entrants covered the prescribed distance within the time limit of four hours, the time for the plane finishing first being 4 hours and 10 minutes, and for the second 5 hours and 33 minutes.

Airplane Markings in Japan

The mark of recognition for the airplane is a sun in red, displayed at each end of the upper surface of the upper wing and of the under surface of the lower wing, as well as on each side of the body (or on each side of the frame if the machine is of the frame system). The name of the airplane is displayed above the number on the rudder, and the number is displayed in Arabic figures on each side of the rudder, or on each outer side (if there are two or more rudders) and on the under surface of the lower wing with its head to the front.

France

Two French airmen, MM. Deulin and de Marmier, have brilliantly mapped out the Paris-Constantinople air route by their initial flight out and back in 35 hours of actual flying. After leaving Paris they made long halts at Strasbourg, Prague, Budapest, Belgrade and Bukarest. The distance of 1,770 miles from Paris to Constantinople was covered in 17 hours of effective flight. The return journey from Constantinople to Paris was made in 18 hours of actual flight.

International Aviation Races in Italy

THE Italian minister of war has just approved a plan submitted by the chief of air service (Comando Superiore di Aeronautica) for several big international aviation races and competitions to take place in September, 1922. The object of these competitions is to increase the creation and construction of new types of airplanes, and prizes will be taken from air service funds appropriated for that purpose.

The first race will be known as the "Grand Prize of Italy" and will be for airplanes. The prizes for this competition will consist of a cup valued at 30,000 lire, a first prize of 150,000 lire and a second prize of 50,000 lire.

The second race will be known as the "Grand Prize of the Tyrrhenian Sea" and will be for seaplanes. In this competition the prizes will be of the same amounts as those for the "Grand Prize of Italy."

In addition to the prizes, 400,000 lire will be spent for the purchase of the Italian airplanes which make the best showing in these two competitions. As at present outlined, each race will be 2,000 kilometres over a circuit not less than 500 kilometres in length. In addition to these two races, it has been decided to have

parachute competitions, the descents to be made from airplanes. Prizes to the amount of 500,000 lire will be awarded in the parachute competitions, which will also be international.

There will be held also a competition for free balloons, the money prizes in this competition amounting to 30,000 lire.

As soon as the detailed regulations governing the above competitions are drawn up information thereon will be forwarded.

Prior to his appointment, the new minister of war was a member of a group of fifty representatives in the Italian house of representatives known as the "Aeronautical Group." This group is made up of representatives from various political parties, organized and pledged to support and assist in all legislative matters for the organization and development of commercial aeronautics. Up to the present time this group has not succeeded in getting any of its proposed legislation through the house. A similar organization has just been organized in the senate along the same lines and for the same purposes. It consists of from 40 to 45 members at present, including many of the most prominent senators, in addition to those who are most prominent in industry and science.

Camp Nichols, P.I., Now an Air Service Station

THE clearing house for Philippine scout recruits for years—Camp Nichols, P.I.—has been converted into an air service station. The old post has been awakened from its peaceful slumber of contentment, the air service troops are policing up the old post, and the interest they take in it is admirable. The quartermaster corps is employing a gang of natives to clear so much of the camp that is to be converted into a flying field. Large trees and innumerable clumps of bamboo are being uprooted by means of a steam roller. Filling and grading are being done by means of plows and harrows. When the new field is completed it will be as level as a billiard table, and will be approachable from all directions. Camp Nichols is located in the suburbs of Manila, and is considered an ideal station.

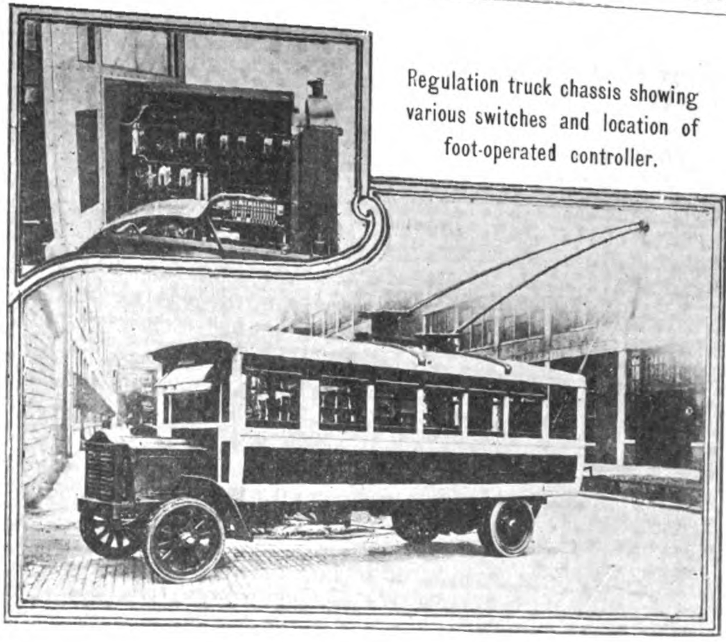
The field is of an "L" shape, the foot of the "L" being slightly over 500 yards in length and the leg of the "L" something over 650 yards in length. The construction of the field for the $5,000 which has just been authorized by the war department will tend to make it one of the most inexpensive fields ever provided for the air service. By having this field and also the $10,000 field to be constructed on Corregidor, all heavier-than-air craft will then be able to fly between, and land at, all stations. The flying field on Corregidor will not be a school airdrome, but one from which service flying can be very readily carried on.

Italy

The Italian publication *The Matin* reports the invention in Italy of a dirigible carrying 90 passengers and a crew of 23. Instead of employing ordinary gases, the ship is enabled to rise by the rarefaction of the air itself within the machine. The machine was built of duralumin, the lightest kind of metal, and consists of a series of concentric chambers, enabling the air to be rarefied in each to such an extent that it becomes lighter than the air outside and the machine is enabled to rise. The process is carried on by machinery connected with motors, and can be varied so as to enable the ship to rise or fall and move at varied speeds.

Siam

During his "round-the-world" journeying, Lord Northcliffe made a stay at Bangkok, and on December 23rd he visited the airdrome at Don Muaung, where Sir Ross Smith alighted during his Australian flight in 1919. The London *Times* correspondent states that Lord Northcliffe was surprised to find the air station equal to most of those in Europe. Siam, he states, has 25 landing places and five airdromes. At Don Muaung there are 115 planes, including school machines and a staff of 650 men.



Regulation truck chassis showing various switches and location of foot-operated controller.

New Vehicle Combines Good Points of Street Car and Gasoline Bus

WITHIN the past few months there has been developed and tested, with satisfactory results, as an adjunct to street car service, the trolley bus, a combination of the gasoline bus and the trolley. The vehicle consists of a regulation bus chassis with a 25-seat body, which is propelled by electric motors, with their control apparatus mounted under the regulation automobile hood. Power is derived from an overhead wire.

From the standpoint of operation the new bus which as now developed has the standard chassis of the Packard truck with electrical equipment furnished by the Westinghouse Electric & Manufacturing Company, has many points in its favor. Two of these reasons follow. Due to its automobile construction it does not need tracks and therefore can draw up to the curb of the street to receive and discharge passengers. It also can dodge with ease trucks or wagons which are directly in its path and thus is not subject to the irritating delays and consequent loss of schedule which constantly interrupt the street car service of nearly every metropolis.

This trolley bus recently tested in Detroit, weighs 11,500 pounds, including two 18-foot trolley poles which may be seen in the illustration. Of the total weight 6,770 pounds is carried on the rear axle so that the weight is very evenly balanced on front and rear axles, a feature that makes the bus very attractive to the transportation official. The propulsion equipment consists of two 25 horse-power Westinghouse ball-bearing motors mounted in tandem and coupled together and to the propeller shaft with flexible couplings.

One feature that the trolley bus has and which permits of one-man operation is a foot controller. The pedal of the foot controller occupies the same place in the cab as the automobile accelerator while the control equipment is located under the hood. In fact the entire appearance of the hood has not been changed an iota, the only difference being that instead of a noisy gasoline engine there is installed electric control apparatus whose silent operation is in direct contrast to the noisy internal combustion engine.

As developed at present the trolley bus is not designed to replace the street car but is merely to act as an adjunct to street car service. It has proved that it is capable of very flexible service and there have been some prophets who go so far as to say that within the next few years the trolley bus will entirely supplant the jitney for city service.

NEW AUTOMOBILE COMPANIES, ROADS, ETC., IN CHINA

AUTO BUS COMPANY UNDER ORGANIZATION IN HONAN.—The ministry of communications has received an application from Mr. Lee Mao-ping asking for permission to organize an auto bus company, to operate a service from the mouth of the Lan-feng-ho river to Tsi-yuen, Honan, with a capital of $50,000. The application has been referred to the provincial authorities of Honan for investigation, and if satisfactory, approval will be granted.

AUTO BUS SERVICE ON CHEFOO-WEIHSIEN MOTOR ROAD.—Since the notification was issued by the ministry of communications calling for reliable merchants to operate an auto bus service on the newly-built Chefoo-Weihsien motor road on franchise, two Chinese capitalists named Chang and Chiang have applied to the provincial authorities of Shantung asking for permission to undertake the enterprise with a capital of $1,250,000. The request is now under consideration by the ministry.

A MODERN ROAD IN SZECHUAN.—The survey of a modern road from Chengtu to Chungking, which is proposed by the Chungking port improvement works bureau, has been started, Mr. Chow Tsing has been appointed to take charge of the bureau.

MOTOR SERVICE BETWEEN KALGAN AND TU-LUN-HSIEN.—The motor service company established by the defence commissioner at Kalgan for running automobiles between the city and Tu-lun-hsien, an important town in Jehol, has recently inaugurated its service. The journey can be finished in one day's time and the single fare for each passenger is charged at $20, each passenger being allowed to carry parcels not exceeding 20 catties in weight.

GOOD ROAD MOVEMENT STARTED BY FOREIGNERS.—The American consul-general at Nanking has lately written to the military and civil governors of Kiangsu, asking for approval of the plan formulated by the Chinkiang Chinese and foreign famine relief association for the construction of a motor road from Chinkiang to Tong-shan at Nanking with famine sufferers' labor.

CONSTRUCTION WORK ON CHEKIANG-FUKIEN PROVINCIAL ROAD STARTED.—An engineering conference of the Chekiang provincial roads bureau was held on March 18th to discuss the necessary measures to be taken in connection with the proposed work. In the conference, it was decided that the Chekiang-Fukien line would be started on March 22nd and that three road construction sub-departments will be established at Hsiao-shing, Linghai and Yung-chiar respectively.

SHANGHAI - MINGHONG - NANWEI - CHOLING AUTOMOBILE ROAD TO BE PROLONGED.—The Shanghai-Minghong-Nanwei-Choling Automobile Transportation Company is planning to prolong its line from Choling to Chapoo and Haining, two important towns in Chekiang, where marine products are abundant and adequate means of transportation are urgently needed. There is a long embankment leading to Haining from Choling and part of it can be made use of for running the automobile service.

CONSTRUCTION COST OF CHEKIANG-ANHWEI PROVINCIAL ROAD.—After careful survey by Mr. Chen Shu-tang, engineer-in-chief, it is estimated that the Chekiang-Anhwei provincial road from Chien-tang-men, Hangchow, to Sze-an-ching, Wuchow, a distance of 234 *li*, will cost $1,170,000 or an average of $5,000 per *li*. On the whole line there will be constructed 67 bridges calling for an expenditure of $600,000 of which one-third will be spent in building two large bridges over Mai-chee in An-kien-hsien and over Nan-chee in Wu-kong-hsien, each with a length of 300 feet. According to the estimate, a total amount of $2,000,000 will be needed in the work including the purchase of auto buses, construction of stations, offices, etc.

SHORT MODERN ROAD UNDER CONSTRUCTION, ANHWEI.—With an appropriation of $100,000 by the Chinese and foreign famine relief association, the construction of an automobile road from Hwai-yuen to Pengpu, Anhwei, a distance of little more than 20 *li*, has been started.

AUTOMOBILE ROAD IN WESTERN HONAN PLANNED.—The military and civil governors of Honan have decided to construct an automobile road between Kwai-ying-dong to Dong-kwai in place of the railway, as the construction of the former will call for a smaller expenditure than that of the latter. Two engineers, Messrs. Hwang Pao and Liu Jen, have been sent to make survey of the road and construction work will be started very soon.

AMALGAMATION OF TWO PROPOSED AUTO BUS COMPANIES.—The Soochow Automobile Transportation Company promoted by Mr. Pan Tze-nee, of Soochow, will be amalgamated with the Soochow-Kashing-Wuchow Automobile Transportation Company which is now under organization.

AUTO BUS SERVICE, NANTUNGCHOW.—The Nantungchow road construction department has decided to introduce automobile transportation service into the whole district of Nantungchow ; at present auto bus service is only operated in the Cheng-kong, Shan-zai and King-sha-sze villages.

NORTH MANCHURIA AUTOMOBILE TRANSPORTATION CO. PROPOSED.—Mr. Chi Hung-kwai, a wealthy merchant of Heilung-kiang, has proposed the organization of the North Manchuria Automobile Transportation Company with a capital of $100,000 to operate a service between Tsitsihar, Harbin, Tao-nan and other important places in North Manchuria.

DUN-CHEE-YUEHONG AUTOMOBILE ROAD PROJECTED.—Some leading merchants of Hwei-chow, Anhwei, have proposed the building of an automobile road from Dun-chee, Anhwei, to Yuehong, Chekiang. As there are many hilly districts between the two pints, the work will involve engineering difficulties and, according to estimate will call for an expenditure of about $1,500,000.

1,010-LI MODERN ROAD UNDER PROJECTION IN KWANGTUNG.—The important merchants of Chao-ching-fu, Kao-yao-hsien, Kwang-ning-hsien and many other neighboring districts in Kwangtung are contemplating the building of district roads in 80 sections, with a total length of 1,010 *li* extending to twelve cities in the province. When completed, these projected roads will lead to the Canton-Samsui and Ning-Yang railways. A detailed map showing all the roads has been submitted to the provincial authorities for approval.

NEW BRIDGES ON GEEHSIEN-TINGHSIANG-WUDAN AUTOMOBILE ROAD.—On the Geehsien-Tinghsiang-Wudan motor road, Shansi, stronger bridges will be built so as to allow heavy freight trucks to pass. The fund for the purpose is to be appropriated by the three districts concerned.

AUTO BUS SERVICE BETWEEN NANTUNGCHOW AND HAIMEN.—A number of automobiles have been ordered from Shanghai by the Nantungchow-Haimen Automobile Transportation Company, recently organized by the leading merchants of the two cities. It is expected that service will be inaugurated at the end of this month.

TSINAN-LOKOW AUTOMOBILE ROAD OPENED TO TRAFFIC.—The automobile road from Tsinan to Lokow, Shantung, has been completed. and automobile transportation service was started on March 27, 1922, by Messrs. Lao Sun-wu and Sung Po-shan.

SIAN-DUNGKWAI AUTO BUS COMPANY PLANNED.—Mr. Woo Kwang-shee, chairman of the Shensi provincial assembly, and Mr. Kuo Yu-chong, chairman of the chamber of commerce at Sian, have planned the organization of an automobile transportation company to operate a service from Sian to Dungkwai. It is reported that the proposal has received the favorable approval of the military and civil governors of the province.

AUTO BUS SERVICE BETWEEN SHANGHAI AND WOOSUNG.—Some time ago it was proposed to establish an automobile company operating a service from Shanghai to Woosung, but the plan was dropped owing to the fact that the newly-built road was not solid enough for such an enterprise. With repair works carried out during the past two years, the conditions of the road have been greatly improved and some Chinese capitalists are again planning to take up the long-proposed enterprise. An engineer has been appointed to investigate the conditions of the road.

AMERICAN PHILANTHROPISTS TO BUILD MOTOR ROAD IN CHINKIANG.—Upon request of the Chinese and Foreign Famine Relief Association at Chinkiang, the American consul-general at Nanking has written to the military and civil governors of Kiangsu asking for permission to construct a motor road from Chinkiang to Tong-sui connecting with the existing Tong-sui—Nanking automobile road with famine sufferers' service under direction of the association.

SHANGHAI - MINGHONG - NANWAI - CHOLING AUTOMOBILE ROAD.—The construction work on the Shanghai-Minghong-Nanwai-Choling automobile road has been started and it is expected that the first section between Shanghai and Ming-hong will be completed in May and that automobile service will be inaugurated on June 1st with eight buses.

NANTUNGCHOW-SHUKAO-HAIMEN AUTOMOBILE TRANSPORTATION COMPANY.—With the district roads in Nantungchow, Shu-kao and Haimen, Kiangsu completed, the gentry of these three neighboring cities have decided to organize an automobile transportation company to run a service between these cities. The company is capitalized at $15,000 divided into 300 shares of $50 each. It is reported that five automobiles have been ordered from Shanghai and that the shipment will arrive at Nantungchow in the near future.

AUTOMOBILE ROAD BETWEEN KIUKIANG AND CHING-TEH-CHING, KIANGSI.—An automobile road from Kiukiang to Ching-teh-ching, the most famous porcelian centre of China, will soon be constructed by the leading merchants of the two cities. The projected line measures bout 200 *li* in length and when completed the journey will take four hours. According to estimate, a fund of $1,000,000 is needed for constructing the road and the purchasing of auto buses. At present an amount of $100,000 has been collected and the balance is being raised in the leading cities of the province.

REGISTRATION OF SHANGHAI-TAITSANG MOTOR SERVICE COMPANY.—The Shanghai-Taitsang Automobile Transportation Company, which has inaugurated a service from Shanghai to Tazang on January 1st, has been officially registered with the ministry of agriculture and commerce. At its recent shareholders' meeting, it was decided that the automobile road would be prolonged from Taitsang if the daily receipt exceeds $300 during the forthcoming three months after through service starts.

AUTOMOBILE ROAD FROM ANKING TO ZIH-YIEN-KWAI.—The Anhwei provincial road construction bureau has started to build an automobile road from Anking to the North suburb known as Zih-yien-kwai, a distance of 25 *li*, with famine labor. An appropriation of $20,000 has been made by the Anhwei civil governor, but according to estimate the fund allocated is not enough to cover the expense.

It is learned that parallel to the automobile road now under construction, there will be built another macadamized road on which heavily loaded freight cars are allowed to pass.

SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—A temporary office of the Soochow-Kashing-Wuchow Automobile Transportation Company has been established. The company is capitalized at $3,000,000 divided into 150,000 shares of $20 each. According to estimate, when the motor service is inaugurated, a net profit of $1,050,000 will be made annually.

It is learned that another automobile road from Sze-an-ching in Changshun-hsien, terminus of the Soochow Kashing-Wuchow line, to Kwang-teh-hsien in Anhwei will be built, connecting with the Soochow-Kashing-Wuchow line.

HANGCHOW-YUEHONG AUTOMOBILE ROAD.—The Hangchow-Yuehong Automobile Transportation Company, which is under organization, has been officially registered with the Chekiang provincial government and is now soliciting subscriptions for capital. The company is to be capitalized at $300,000 with 60 shares of $50 each. Up to date, an amount of over $200,000 has been raised.

PLAN AUTOMOBILE SERVICE BETWEEN YUEHSIEN AND HSUCHONG.—The gentry of Yuehsien and Hsuchong, Honan, have decided to establish an automobile transportation company to run a service between the two cities. The automobile road is under construction and is expected to be opened to traffic in May, 1922.

AUTOMOBILE SERVICE IN SHANTUNG.—The Tsinan-Lokow Automobile Transportation Company, Shantung, inaugurated its service on March 1st with about ten buses, each capable of accommodating 20 passengers.

The motor road from Yu-chen to Tung-chong, which was constructed by the American red cross, has been handed over to the Shantung provincial authorities. It is learned that a certain Mr. Pao has applied to the Chinese officials for the operation of a motor service on the red cross road and that his application has been received favorably.

CHONGCHOW-SHIHCHIACHONG SECTION TO OPERATE MOTOR SERVICE.—Mr. Chang Ching-jao has applied to the ministries of agriculture and commerce and communications asking for permission to operate an automobile service on the proposed railway line from Chongchow to Shihchiachong, Chihli, of which the foundation work has been completed.

MOTOR ROAD TO CONNECT NANTUNGCHOW WITH SHUKAO.—With a view to facilitating communications, the gentry of Nantungchow and Shukao, two neighboring districts in Kiangsu, have planned the construction of an automobile road between the two districts. A survey is being carried out and construction work will be started very soon.

MARKET FOR MOTOR VEHICLES IN CHEKIANG.—A number of auto buses will be soon ordered for service on the projected Chekiang-Fukien provincial road, Chekiang-Anhwei provincial road, Hangchow-Yuhong, Haining-Changan and Ningpo-Fenghua-Chinghai automobile roads, some of which are under construction. Mr. Yue Teh-lan, engineer-in-chief, has taken the matter of purchasing buses with the military governor of Chekiang.

CHEFOO-WEIHSIEN AUTOMOBILE ROAD.—The ministry of communications has drawn up a set of regulations containing seven articles governing the management of the Chefoo-Weihsien automobile road and the organization of an automobile transportation company to operate a service thereon on franchise.

LUNGKOW-WEIHSIEN AUTOMOBILE ROAD COMPLETED.—The Lungkow-Weihsien automobile road in Shantung had been completed and auto-bus service thereon was inaugurated on March 1st, 1922.

MOTOR ROAD COMPLETED AT NANTUNGCHOW.—An automobile service has been inaugurated on the Shan-maloo road, Nantungchow.

CONSTRUCTION OF HANGCHOW-YUHONG AUTOMOBILE ROAD PROGRESSING.—The Hangchow-Yuhong Automobile Transportation Company, organized by Messrs. Koo Nai-ping and Chang Ying-ching, with a capital of $300,000 divided into 6,000 shares of $50 each, has recently secured registration with the ministry of communications. The projected line is to start from Kwai-ying-jao, Ho-sze, Hangchow, and end at the suburb of Yuhong. Two large stations will be established at Hangchow and Yuhong with smaller ones at Ho-sze, Tung-ngao, Liu-sha and Yen-ling-poo. At present offices have been established at Pan-er-hong, Hangchow, and Hsiao-lung, Yuhong, respectively.

PEKING TIENTSIN AUTOMOBILE ROAD.—The construction of the Peking-Tientsin automobile road has been started under direction of the local police authorities and Mr. Hsuan Shee-ling.

TRANSPORTATION FACILITIES IN CHENG-KIANG, KIANGSU.—An automobile transportation company is being organized to operate a service from Wusih to Cheng-kiang, by the local authorities.

TWO IMPORTANT HIGHWAYS IN HUPEH, PROPOSED.—Mr. Pao Ching-yue has proposed the construction of two important automobile roads in Hupeh, one from Hsiang-yang to Shatze and the other from Hsiang-yang to Kwang-sui viâ Ying-shan, connecting with the Peking-Hankow railway. The proposal is under consideration by the local authorities.

ROAD CONSTRUCTION IN SZECHUAN.—Under the leadership of Mr. Chow Ching, the director of the Szechuan provincial road bureau, the construction of the important highway from Chengtu to Chungking is steadily going on. Another modern road at Kiang-pei has been started.

AUTO-BUS SERVICE ON NEWLY-BUILT CHEFOO-WEIHSIEN ROAD.—In reply to the advertisement of the ministry of communications calling for reliable merchants to operate an auto-bus service on Chefoo-Weihsien motor road on franchise, Messrs. Chang Shi-gee and Chiang Pong-song, general manager and assistant manager of the Lungkwo Port Construction Company, at Lungkow, Shantung, have applied to the provincial authorities of Shantung for the privilege. The request has been referred to the ministry of communications for consideration.

SOLDIERS ASSIGNED TO CONSTRUCT CHEKIANG-FUKIEN PROVINCIAL ROAD.—The construction of the Chekiang-Fukien provincial road has been started with 3,400 soldiers under control of General Lu Yung-Hsiang, tuchun of Chekiang. The line is divided into 17 sections as follows:

(1) From Tih-ling-kwai, Si-shun, to Chien-ching-ching, 40 *li*.
(2) From Chien-ching-ching to the city of Hsiao-shun, 45 *li*.
(3) From the city of Hsiao-shun to Sung-chiar-zai, 36 *li*.
(4) From Sung-chiar-zai to Tso-yuen-der, 26 *li*.
(5) From Tso-yuen-der to the city of Chen-hsien, 25 *li*.
(6) From the city of Sing-cheng-hsien to Kwai-ling, 52 *li*.
(7) From Kwai-ling to Tien-den-hsien, 40 *li*.
(8) From Tien-dan-hsien to Chung-doo-ching, 50 *li*.
(9) From Chung-doo-ching to Ling-hai-hsien, 50 *li*.
(10) From Ling-hai-hsien to Hwang-ngai-hsien, 52 *li*.
(11) From Hwang-ngai-hsien to Shih-kuo-ching, 50 *li*.
(12) From Shih-kuo-ching to Song-gee-kong, 40 *li*.
(13) From Song-gee-kong to Ching-kiang-doo-kow, 40 *li*.
(14) From Ching-kiang doo-kow to Liu-sze-ching viâ Hung-jao-ching, 55 *li*.
(15) From Liu-sze-ching to Wenchow, 50 *li*.
(16) From Wenchow to Ting-dien-ching in Sui-an-hsien, 40 *li*.
(17) From Ting-dien-ching to Ping-yang-hsien, 50 *li*.

DUNGCHEE-HANGYUE AUTOMOBILE COMPANY PROPOSED.—Some Anhwei merchants residing in Shanghai such as Messrs. Woo Dih-ching, Lee Tan-foo, Wang Zing-poo, etc., have proposed the organization of an automobile transportation company with a capital of $1,500,000, with 30,000 shares, for operating a service from Dungchee, a town in Hweichow, Anhwei, to Hangyue, Chekiang, viâ Yue-chien and Chong-hua in Chekiang.

SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—The Soochow-Kashing-Wuchow Automobile Transportation Company which is under organization will amalgamate with the Soochow Auto Bus Service Company proposed by Mr. Pan Tze-nee. The projected lines have been re-adjusted as follows:

(1) The Soochow-Kashing main line is to start from Soochow and end at Cha-poo, Chekiang, viâ Woo-kiang, Ping-wang, Pei-cha, Chen-shih, Wang-kiang, Ka-shing, Sing-foong and Ping-ho, with a branch line from Dung-ting to Dung-hsiang viâ Tung-shan, Kwang-foo, Dung-lee, Li-lee and Po-yuen.

(2) The Soochow-Wuhu main line is to start from Soochow and end at Kwang-teh, Anhwei viâ Woo-kiang, Pei-cha, Tseng-shih, Nan-zing, Ju-kwai-tze, Wu-chow, Chang-shun and Sze-an, with a branch line from Wu-ching to Hangchow viâ Liang-ho, Sing-tze, Wu-kong and Tien-mo-shan.

(3) The Soochow-Taichong main line is to start from Soochow and end at Taichong, connecting with the Shanghai-Taichong line.

(4) The Soochow-Changzao main line is to start from Soochow and end at Foo-shan-ching viâ Changzao with a branch to Tong-kow.

MODERN ROADS IN ANHWEI.—At a recent meeting of the provincial road construction bureau of Anhwei, four important provincial highways were mapped out:

(1) From Anking to Chin-teh-ching, Kiangsi, viâ Tung-liu and Chiu-poo.
(2) From Wuhu to Kwang-teh viâ Hsuan-chen and Long-chee.
(3) From Wuhu to Tun-chee-ching viâ Shih-dien, Tai-ping, Tsing-teh, Tsi-chee, Shi-hsien and Shu-ning.
(4) From Anking passing through Sze-chen and Hur-vee, thence one line leading to Loa-an and another to Pengpu.

Of the above proposed roads, the ones from Wuhu to Kwang-teh, Anking to Loa-an and Anking to Pengpu will be built first, as the local gentry have decided to take up the construction work.

Another motor road from the north suburb of Anking to Feng-sui-poo viâ Wu-lee-tun and Chih-yien-kwan, a distance of 25 *li*, is also being considered. This road, though rather short in distance, is a most important highway leading to the capital of the province, and construction work on it will be soon carried out with famine sufferers' labor. For facilitating communication, another automobile road surrounding the city of Anking will be built.

AUTOMOBILE SERVICE IN SHANSE.—Automobile transportation services from Taiyuenfu to Cheng-hsien viâ Gee-hsien and Wu-dan in the north and from Taiyuenfu to Pin-yao viâ Feng-yang and Chi-hsien in the south, Shansi, were officially inaugurated on April 15.

MOTOR SERVICE COMPANY PROPOSED IN SHANTUNG.—Mr. Ma Vee-yien, of Shantung, is associated with a number of capitalists for the organization of an automobile transportation company to run a service from Tsining, Shantung, to Kaifeng, Honan. It is stated that automobiles have been ordered from Tientsin.

AUTOMOBILE TRANSPORTATION SERVICE IN SHANG-TSAI-HSIEN.—A motor road from Si-ping to Chow-chiar-kow in Shang-tsai-hsien, Honan, has been completed and an automobile transportation company to operate a service on the new road has been established with a capital of $50,000. A shipment of more than ten auto buses has been supplied by the Jardine, Matheson & Co. at Hankow, and service will be inaugurated very soon.

CHENGTU-KWAIHSIEN AUTOMOBILE ROAD STARTED.—The construction work on the Chengtu-Kwaihsien automobile road, Szechuan, a distance of 120 *li*, which is to have a width of 18 feet and is to be macadamized, has been started. The construction of another important line from Chengtu to Chungking will be postponed for some time.

AUTOMOBILE SERVICE BETWEEN WEIHSIEN AND LUNGKOW, SHANTUNG.—Automobile service from Weihsien to Lungkow, Shantung, has been inaugurated. Incompletion of a bridge over the Hwai-ho, still necessitates the use of ferry boats at this point.

TWO AUTOMOBILE TRANSPORTATION COMPANIES UNDER ORGANIZATION.—Mr. Lee Hung-ping of Honan and Mr. Chang Ching-jao of Chihli have applied to the ministry of communications for permission to organize the Kaifeng-Tsiyuen Automobile Transportation Company and the Chongchow-Shihkaichong Automobile Transportation Company respectively.

CHING-TSI-HWANG-CHIAO AUTOMOBILE TRANSPORTATION COMPANY.—Messrs. Kuo Ping, Wai Hsiao-yu, Lu Ting-liang and others have organized an automobile transportation company to operate automobile services from Ching-hua to Chiao-wai-ying and from Hwang-ho-jao to Tsi-yuan. The company will not construct any motor road but will rent the old roads from the Honan provincial government on franchise. However, it is necessary for the company to repair the road along the projected line. The line is 280 *li* in length, 5 per cent. of the total yearly profits will be paid by the company as rent. Some branch lines are under consideration, of which, the one from Ching-hua to Sing-yang-hsien will be constructed first. The company is capitalized at $150,000 in 300 shares of $500 each and has been officially registered with the Honan industrial bureau.

The estimated expenditures in connection with the enterprise are given in the following itemized statement:—

Cost of Land.—The cost of land for constructing the road from Chiao-wai-ying to Ching-hua and for stations, offices and auto-bus sheds is estimated at $10,000.

Earthwork.—Earth required for widening, filling and grading the new road and some parts of the old roads will cost about $10,000.

Surfacing.—Gravel for surfacing the old roads and the new road from Ching-hua to Chiao-wai-ying will cost about $10,000.

Bridges.—Three bridges are to be built and are estimated to cost $10,000.

Buildings.—Sixteen stations, auto-bus sheds and machine shops will be erected and are estimated at about $10,000.

Automobiles and Road Roller.—Four passenger cars at $7,000 each, four trucks at $5,000 each, two small cars at $1,000 each and one road roller at $1,000 will be purchased, making a total of $55,000.

Tree Planting.—About 24,000 trees will be planted along the road, at an expenditure of $1,000.

Furniture and Fixtures.—Telephones, allowances to police stations for additional policemen, surveying apparatus, furniture and fixtures for the various stations are estimated at $10,000.

Reserve Fund.—A fund of $14,000 is set aside to provide for deficits in the above itemized costs.

ESTIMATED EXPENDITURES IN CONNECTION WITH THE CONSTRUCTION OF THE SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—The estimated costs of building the Soochow-Kashing-Wuchow highway are placed at about $3,000,000, given in the following itemized statement:—

Cost of Land.—About 8,340 *mow* of land will be required for constructing the road measuring 696 *li* long and 40 feet wide, estimated at $50 per *mow*, or a total of $417,000. Other expenses and allowances for the removal of tombs, houses, etc., the total cost of land is placed at $440,000.

Earthwork and Surfacing.—A total of about 500,400 *fond* of earth is estimated as necessary for filling, grading, etc., costing about 60 cents per *fond* including cost of sand for surfacing, or a total of $600,480.

Stone and Gravel.—The road is to be covered with gravels on which two stone rails, each with a width of 1-ft. and a depth of 5-in. will be laid. It is estimated at $300 per *li*, or a total of $208,500.

Bridges.—There will be built 253 bridges which is placed at $506,000, at an estimated average cost of $2,000 each.

Automobiles.—100 passenger cars at $6,000 each and 60 trucks at $4,000 each, a total of $840,000.

Buildings.—The ten large stations at Soochow, Pingwang, Kashing, Chapoo, Nanzing, Wuchow, Chang-shun, Kwang-teh, Taichong and Changzao, which are to have offices and dormitories attached, will cost $50,000 and the small stations at other places will cost $25,000, making a total of $75,000.

Tree Planting.—About 100,000 trees will be planted along the road calling for an expenditure of $10,000.

Furniture and Fixtures.—Telephones, allowances to police stations for additional plicemen, surveying instruments, furniture and fixtures for the various stations are estimated at $80,000.

Road Rollers.—Four 9-ton road rollers at $10,000 each.

Reserve Fund.—A fund of $200,020 is set aside to provide for deficits in the above itemized statement.

When all the itemized estimates are added up, the total amounts to $3,000,000.

PROVINCIAL ROADS IN SZECHUAN.—In Szechuan province there will be built six important provincial roads which have been mapped out as follows:—

(1) From Chengtu to Chungking.
(2) From Chengtu to Van-hsien.
(3) From Chengtu to Ka-ting.
(4) From Chengtu to Kong-ting with a branch line from Han-yuen to Hwai-lee.
(5) From Chengtu to Kwai-hsien.
(6) From Chengtu to Kwang-yuen.

All of these projected roads are to have a width of 30 feet. The two lines from Chengtu to Chungking and from Chengtu to Kwai-hsien are to be built first under directorship of Gen. Chow Ching and Gen. Liu Chen-hsuan respectively. Besides these provincial roads, a number of district roads will be constructed. The fund for the work will be raised by issuing a public loan in the province.

REGISTRATION OF AUTOMOBILE TRANSPORTATION COMPANY.—The Hangchow-Yuehong Automobile Transportation Company which was promoted last year by Mr. Koo Nan-ping has been officially registered with the Chekiang provincial road construction bureau. Survey of the proposed road has been completed.

PROVINCIAL ROADS IN SOUTHERN FUKIEN.—The provincial road from Shih-mar to Chong-chow in Fukien has been opened to traffic, and another important road from Fur-kung to Chong-chow has been completed. At present the journey from Chong-chow to Amoy takes only three hours by automobile.

SOOCHOW AUTOMOBILE TRANSPORTATION COMPANY UNDER ORGANIZATION.—The Soochow Motor Service Company is being organized by Mr. Pan Lee-kuo with a capital of $52,000. An application for approval and registration has been made to the local authorities.

KIU TAH AUTOMOBILE TRANSPORTATION COMPANY.—Messrs. Yuen Chien-tze, Kao Yih-ting and Lee Chao-chu, of Chow-kow-ching in Sih-yih-hsien, Honan, are planning to organize the Kiu Tah Automobile Transportation Company to run a service from Chow-kow-ching to Len-ho, Honan.

Aviation Development in Italy

A POLICY of strict economy in army expenditures is to be inaugurated by the new Italian minister of war, the Hon. Gasparotto, who has been in office about five months. Both military and civil aeronautics in Italy are under the minister of war, and he recently made the following statement of his intentions concerning the air service:—

"It is my intention to cut down all branches of the army including the air service. The military air service will be kept within the limits strictly essential for proper war preparation. The development of civil aviation must be undertaken on a large scale. In this manner the appropriations for aeronautics will not be wasted in industrial ventures of which the state is always a most unfortunate administrator. The appropriations are to be spent wisely; for specific experiments, for the purchase of new material, for the preparation of the personnel and for equipping the various branches of the air service. As far as possible recourse will be had to private enterprises, stimulated by free competition, rather than to government establishments which are a burden to the state and are apparently kept up to maintain the employees in service. The plan for reforming and reorganizing the air service has been drawn up by the advisory committee for aeronautics, but the army air service must be duly considered and any reorganization must go hand in hand with the army organization.

"Civil aviation will receive the greatest possible support from the government, but always with the idea of developing and in full co-operation with the military air service. Thus, with a minor expenditure of money there will be created not only a strong air service for Italy's possible future defense, but also a source of industrial wealth and a large exportation."

大正七年七月十日第三種郵便物認可

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

WATCH NORTHCLIFFE

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GREAT CHINA COTTON MILL

JAPAN'S ELECTRICAL DEVELOPMENT

CHINESE EASTERN RAILWAY

Vol. XVIII JUNE, 1922 No. 6

A. L. TAYLER

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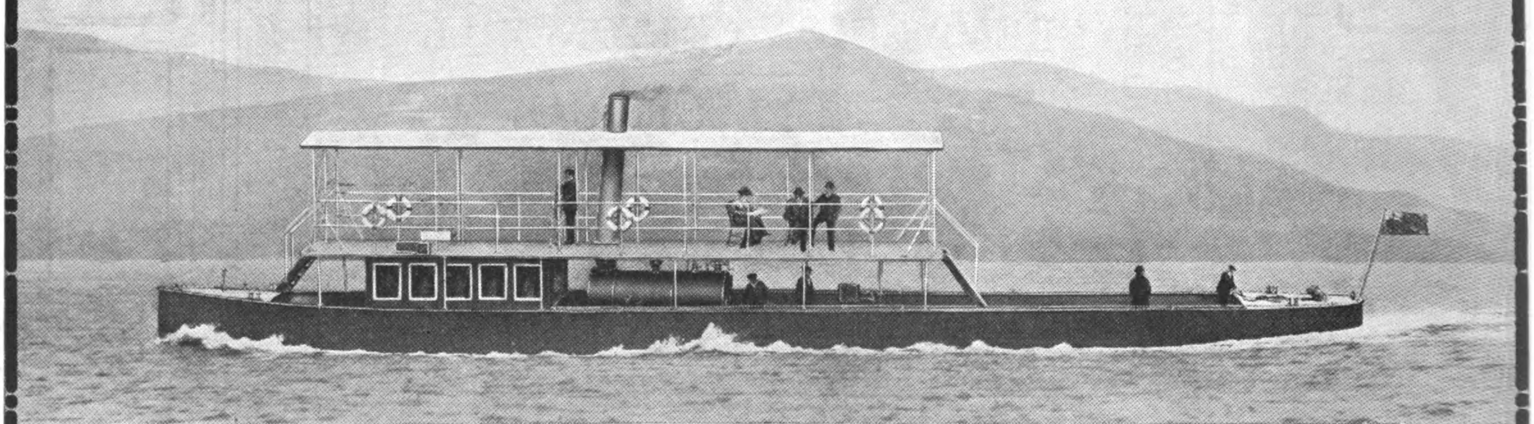

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JOHN FOORD

A Fearless Journalist of the Old School; He organized the American Asiatic Association in 1898 to combat the Closed Sphere policy of European Powers in China. Former Editor-in-Chief of *The New York Times, Harper's Weekly,* Editor and Founder of *Asia,* who died in New York at the age of 78 from injuries received in an automobile accident.

(From The New York Times)

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

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WATCH NORTHCLIFFE

Some Simple Words of Common Sense

(Japan's Standing Army Numbers 230,000 Men)

ONE wonders just what is at the bottom of the new anti-Japanese campaign launched in England by Viscount Northcliffe. Coming as it does immediately after the Washington conference and the collapse of the former campaign to provoke hostilities in the Pacific, it would seem that the owner of *The Times* had decided to fire the hearts of the British into taking over the job that America rejected.

Thanks to the Washington conference, war between Japan and America was averted by a frank exchange of views and the whole world now knows exactly where Japan stands in regard to her policies on the mainland of Asia. Is her word to be doubted and her honor placed in question before she has even time to make good? Have the prime-movers of the anti-Japanese campaign prevailed upon Northcliffe to carry on and keep alive the agitation in the hope of discrediting Japan in Great Britain, and turning the British against their former ally in the same manner as they almost provoked a war between Japan and America by their one-sided testimony? The anti-Japanese agitation received a well-merited rebuke in the United States. The Americans will have none of it and there are indications that an official enquiry is to be started in order to ascertain who was at the bottom of this diabolical attempt to bring about hostilities in the Pacific. Yet Northcliffe takes up the campaign where the American fire-eaters left off, with a vehemence and virulence that relegates them to a back seat.

Japan's Army for Defense

"For what purposes are the great Japanese home and overseas army and the great Japanese fleet being maintained," he asks and then answers the question to his own satisfaction: *For the control of China.* Northcliffe might have answered that question by a little superficial study of Far Eastern history without swallowing hook, bait sand sinker the stories told him by those interested in creating a wrong impression. He would have been able to state, and state truthfully, that Japan is maintaining a large army for the identical reason that his own government insists upon having the greatest navy on earth, for the identical reason that France maintains the largest army in Europe, for the identical reason that Italy refuses to disarm, for the identical reason that France demanded an adequate submarine force to protect her against a possible enemy, for the same reason that all nations of real men have from time immemorial maintained large armies and fleets and for the same reason that these same nations of men will continue to do so until the trump of Gabriel's horn sounds the end to all mundane strife. Japan is maintaining her great army for defense.

Against whom? For the same reason that the late allies are preserving intact their fighting forces in Europe, with this difference. While the allies fear Germany, Japan is watching Russia. It is nauseating to read the arguments advanced to justify the maintenance of allied forces in preparation against a war of revenge on the part of Germany when the latter nation is down and out for another twenty-five years, and then read the villification of Japan by the same writers because she insists on applying the same law of self-preservation against the possible come-back of Russia. It is the most hypocritical piffle that has ever disgraced the pages of European and American journalism. What is good for England, for France, for Italy, is good for Japan. Her old enemy outnumbers her four to one, and if Japan ever goes to sleep and listens to the siren song of the pacifists, her days as a nation will be numbered, in the same way that if Britain ever surrenders her naval supremacy, the story of her greatness will become ancient history.

Now Northcliffe would have the world believe that the Japanese army is maintained for the sole purpose of conquering China. He is not impartial enough to state that China's weakness has been the bridge over which Russia has in the past advanced to the conquest of Japan. In the sudden passion to befriend China, Northcliffe loses sight of the fundamental moves of twenty-two years ago which gave rise to the whole Far Eastern problem, the moves by which Russia would have gained her objective and found the coveted road to India through the domains of her ally and dupe. Northcliffe overlooks that the war of 1905 was not only a life and death struggle for Japan, but one in which the very existence of the British empire was at stake. For had Russia gained the victory, her armies would have swarmed into Western China, into Tibet, down through the passes of the Himalayas, and taxed the man-power of the British empire to have kept them from overflowing into India. Why do British writers close their eyes to these truths and refuse to recognize Japan's precarious position? Is it not true that Russia's preparations for a war of revenge, compelled the Japanese to stagger under a heart-breaking burden of taxation in order to maintain their fighting forces at a level that would enable them to defend themselves (and the British empire) when the day arrived for Russia to again take the field? Is it not true that Russia amputated Mongolia from China for the sole purpose of attacking Japan's position in Manchuria from its most exposed side? Is it not true that Russia was secretly building her strategic railways from Bokhara to the Afghan frontier at the same time? Why then should Japan relinquish her one guarantee of national existence in order to meet the criticisms of those who demand that their own defenses be maintained against the recuperation of Germany?

An Overworked Bogey

Northcliffe is holding up the bogey that has been worked to death for the past ten years in order to frighten China. *The Japanese will get you if you don't be good.* This old scarecrow has served its purpose, and something else must be found to take its place. As we pointed out only last month, the Japanese are "fed up" with this propaganda, and public opinion will rebel at any further

attempt to make their country the "policeman of China." Northcliffe is perhaps ignorant of the fact that on two occasions during the war when foreign lives and properties in North China were menaced by internal disorders, the Japanese minister was requested by his colleagues to have Japanese troops sent to China for police duty. That can never happen again. Hereafter, if the present temper of the Japanese people holds good, other powers will have the opportunity of demonstrating their real friendship for China by sending their own troops to protect their nationals and properties in the event intervention becomes necessary.

Suppose Northcliffe's question was answered in this wise; Japan is maintaining a huge army in order to be ready at a moment's warning to assume a humanitarian duty that the British, American or other foreign armies cannot be relied upon to perform. Remembering that in the past, the diplomatic corps at Peking when confronted with a grave crisis, has requested Japan to send troops to China to protect foreign lives and properties, and that present conditions in this country may lead to another such crisis, would Viscount Northcliffe care to place the facts squarely before the British public and tell them frankly that they must be prepared to send 100,000 or more troops to China in order to fully protect British interests? Or, would he, if the occasion arises, revert to his old platform and call upon the "Honorable Ally" to take over the burden of protecting British lives and properties in China? He could not consistently do this, so he would be compelled to tell the British public the truth, that the Japanese army will never be employed as a police force for the benefit of other foreigners in China. If China fails to put her house in order and invites intervention, and Japan adheres to the above policy, perhaps Northcliffe will explain to the British people just how much it will mean in military expenditure for the protection of their interests in China.

Northcliffe sounds the warning, "Watch Japan." Suppose the tables were turned and Japan controlled the greatest newspaper in the world, and asked the same questions about the British navy and warned its readers to "Watch England." Would he be willing to admit that Great Britain requires watching? Has not Great Britain been actively engaged while others were talking and consolidated her hold on the approaches to India, taking over Mesopatamia, emasculating Persia and bringing Hedjaz under her protecting wing? Has Great Britain relaxed in any way her grip on Tibet or overlooked any minor point in the great game of empire? Did Japan sound the warning, "Watch Britain," while she was so intently safeguarding her own interests against the day when Russia will resume her onward march? Why watch Japan, when she also is preparing against the same menace?

Is Japan Justified?

Is Japan justified in maintaining an effective army for defence? Who is to be the best judge of Japan's necessities? Who can fathom the exact meaning of the recent alliance entered into between Germany and Russia in open derision of the Genoa conference? Is not all this in line with policies already exposed, a confirmation of the statement made to Kenneth Roberts of the *Saturday Evening Post* year before last by the German commissioner of emigration? Siberia is to become the land of promise for Germany's millions, the Altai mountains the storehouse from which Russia and Germany will draw their supplies of iron, copper and gold that will enable them some time in the future to again re-open the conflict for world dominion. Is not every word of that frank statement of intentions being corroborated by events? Has not Mongolia once more passed under the control of a people's revolutionary government directed by Soviet advisers, the properties of foreigners confiscated, their business ruined and themselves compelled to flee from Urga? Does not everything point conclusively to the working out of a set program in this part of Asia, which once more must involve Japan in a life and death struggle because of the inability of China to perform her international duties?

Let us turn to the picture in Europe, where every sign points to another general outbreak as a result of the Russo-Germanic defiance of the allies, with France grimly determined to protect herself against the new menace. The significant speech of Clemenceau at Nantes was not needed to emphasize the gravity of the situation. Facing a new Russian offensive, Poland is caught between the jaws of the nutcracker. The collapse of Poland will be followed by the fall of the little entente, leaving France once more standing alone with her back to the wall facing this new coalition. Who can most effectively hold Russia in check; the British army or the battalions of the Mikado? In view of this crisis, pregnant with grave events, who has the right to challenge or question the reasons for the maintenance of a great army by Japan? Notwithstanding the opinions of Northcliffe, it is just possible that the Japanese are living up to the traditional spirit of the Samaurai, that obligates them in honor to stand by their allies and be ready at a moment's notice to assume their share of the burden in carrying out the pact of Versailles. No critic has the right to question the *bonâ-fides* of Japan at a moment, when the fate of Europe hangs in the balance.

Who Will Protect China's Integrity?

At a recent conference of Japanese admirals and other high officials at Tokyo, a resolution was adopted to the effect that every precaution must be taken by extending connections with neighboring regions to make sure of supplies, and thus, in the event of war, ensuring a drawn battle. *The Times* regards this as a serious symptom of misinterpretation of the Washington conference and believes it is the intention of Japan to develop economic relations with China, exploiting her resources in order to compensate for the restrictions imposed at Washington on the naval expansion of all the participants in the conference. In other words, Northcliffe again says, "Watch Japan." Why not watch the developments in Europe, in Central Asia, which compel Japan to be on her guard night and day against a forward movement of the Soviet? Who is to undertake the preservation of the *status quo* in Mongolia? Under no conditions will an American or British army ever be disembarked upon the shores of Eastern Asia for the purpose of preserving intact the integrity of China and giving effect to the principles underlying the consortium agreement which holds that Mongolia is a most important part of China. Who is to defend this fundamental principle of the powers interested in the preservation of the Chinese republic? If America, Great Britain or France cannot be relied upon to check the "menace from the direction of Urga," and impotent China cannot safeguard her own integrity, who then, is called upon by the highest law of self-preservation to step into the breach? Are we to believe that *The Times* now favors Russia having a free hand in Central Asia, making herself the overlord of Mongolia in order to carry out the self-confessed designs of Germany in these regions, and bring Russia once more into a position where she can attack Japan upon her exposed flank in South Manchuria? Is Japan to be emasculated in order that Russia may gain a position that menaces her very independence? Unless Northcliffe can give some better explanation than has yet appeared in *The Times*, it would appear that Japan is being held up to world odium, in order to divert attention from the activities of Russia and Germany. Northcliffe might explain to the British people just how they will protect India, once a German controlled Russia is firmly established in Mongolia. There may be some understanding that will relieve India from this pressure, but we reject this at once as wholly inconsistent with British sense of honor. With a full knowledge of the march of events in Central Asia, it is difficult to understand a change of policy which consigns a faithful ally to the scrap heap as soon as her usefulness is terminated. We can understand Northcliffe's sympathy with China and his campaign for the cancellation of the Anglo-Japanese alliance, but we cannot understand why it is being prolonged when every sign points to the time when Japan may again have to take active steps to defend her vital interests. Is Japan to be made the target of a new propaganda, while Russia and Germany are upheld in an alliance which cements the latter's hold on Siberia and hands Mongolia over to them both? If the

Japanese army is to be reduced with these events transpiring under our noses in Central Asia, who is to defend the integrity of China, who is to give effect to the consortium principles, who will counteract the pressure upon India, who will guarantee that Japan's vital interests will not be placed in jeopardy ? Let Northcliffe answer this question fairly, and the world will gather a better idea of the drift of his propaganda. This attempt to isolate Japan by turning world opinion against her and leaving her friendless in the event of a clash in Eastern Asia, has a deep significance, one which will not pass unnoticed by all fair-minded peoples and governments.

Northcliffe tells his readers to "remember the Twenty One Demands" which Japan attempted to force upon China while Great Britain was plunged in war and then goes on to enumerate them all over again, just after Japan has surrendered at Washington all that she gained through their imposition, with the sole exception of the lease to the Liaotung peninsula. What is the object of raking up these old demands in this fashion at this time ? To call attention to Japan's retention of Port Arthur and the Liaotung territory ? If this be so, then Northcliffe might read with considerable profit and enlightenment the reasons given by Mr. Balfour at the Washington conference for Great Britain's retention of the Kowloon lease. It ought to be a liberal education to him on fundamental Chinese problems.

Japan's Existence Imperilled

American editors have received a liberal education in world politics since 1914. They have learned to think for themselves. They may not as yet fully grasp all the intracacies of Asiatic politics and policies, but they are learning. From a mass of American editorial comment on the recent Russo-Germanic alliance, we select the following from the well-informed *Boston Transcript*:—

"Not enough of the details of this alliance are known at this writing to warrant any attempt at an analysis of it, but it is quite plain that the signing of the agreement, over the heads of the inviting powers of the conference, will necessitate an entire readjustment, and a much closer adjustment, of the relations between the Western European powers—unless, indeed, Lloyd George himself is in the plot, and has made up his mind to throw France overboard for good and all for an understanding with Germans and Bolshevists. As such an explanation is untenable, it is clear that the original and main purpose of the conference itself—which was to unite all Europe for a stabilization of exchanges—is wrecked by the special arrangement now entered into between Germany and Russia."

If Northcliffe desires to create the impression that Britain has thrown over her old allies for some understanding with Germans and Bolshevists, he is going the right way about it. Fortunately, however, the world also understands something of the difference of opinion which estranges the owner of *The Times* and the premier of Great Britain, and makes allowances. The unreasoning anti-Japanese propaganda of *The Times* at this time can therefore only set others to pondering over signs and portents which lead to the suspicion that this sudden outbreak against Japan may conceal some new understanding, some new line-up, in which Germany, Russia and China are to be encouraged into forming a combination that will eventually eliminate Japan as a serious competitor in world trade by shutting off her raw supplies in neighboring regions on the mainland of Asia.

Japan made great sacrifices at Washington in order to dispel misconception about her policies. She accepted the dictum that her people may not overflow into lands pre-empted by the white races to expand in ; she acquiesced in a policy which prohibits her people from owning land in Manchuria and Mongolia in deference to Chinese ideas about their sovereign rights ; she accepts the verdict that there is no place in the world (except South America and some isles of the Pacific) where her people may emigrate to, and says in effect : "We accept your plan for the limitation of naval armaments, we forego our ideas of conquest and will keep our children at home and develop our place in the sun as an industrial nation and face you in the struggle for existence on an equal footing. All that we ask in return is that our near-by sources of raw materials, of food, and other necessities of life, be not barred to us. Our very existence as a nation, as a people depends upon this assurance." The world applauded and has given Japan her chance to work out her destiny along these lines. It means, if anything at all, that Japan must have fair-play in which to develop her industries and find her markets in open competition with other nations. Any policy tending to deprive her of near-by sources of raw materials and food, must, in the end, drive her to fight once more for the right to exist. And it is our honest opinion that any propaganda that helps to bring about such a conflict by encouraging a combination of Russia, Germany and China to shut her off from these sources of supplies in Mongolia or Manchuria by handing over these territories to Russian exploitation, will merit the execration of the civilized world. Instead of isolating Japan, when the true facts are understood, it will bring world opinion as solidly behind her as it was in her previous struggle for existence. Northcliffe overlooks this.

What would honest British opinion say if the Japanese started a counter campaign and harked back to the days of 1898 and invited the world to remember the British ultimatum to China ? Would honest Britons relish such muckraking of the old diplomacy in order to discredit them in the eyes of the Chinese ? Would Northcliffe wish to have British prestige in China impaired by constant harping on the fact that the most important British railway concessions in this country were obtained in the identical manner as Japan secured her advantages under the twenty-one demands ? Would he not have to admit that his own government was actuated by the same reasons which prompted Japan seventeen years later to apply similar remedies in self-defense ? The British government still enjoys the fruits of that ultimatum, while Japan has surrendered what she forced from China, with the sole exception of the Liaotung lease, and even here, she is willing to follow the lead of Great Britain and France if they will forego the similar leases to Kowloon and Kwangchowwan.

Would Northcliffe dare to come out openly in his great newspaper, and advocate a square deal for China in designing and operating her own national system of railways, that China be permitted to develop the port of Canton in her own way so it will serve as the deep water outlet for the Canton-Hankow and the other projected lines of South China ? Until he can do this with a clear conscience, his attacks upon Japan savor of smug hypocrisy.

Responsibility for China's Militarism

Why does Mr. David Fraser, the Peking correspondent of *The Times* (now at home) take up the hymn of hate and blame Japan for China's militarism, because of the Nishihara loans to the Anfu clique ? Japan, he says in a recent article in *The Times*, "is rightly charged with being largely responsible for the militarism that is now the curse of China."

Would Mr. Fraser care to go back a few years and tell the truth about the reorganization loan ? Others have told it. That loan provided Yuan Shih-kai with the millions which turned him into a military despot, enabled him to build up the huge army in the North and create a military oligarchy which was employed to crush the growing germ of democracy in the South. Who placed the yoke of militarism upon China ? Who created the vampire oligarchy which in an unbroken line since Yuan, has fastened its claws upon China and sucked its life blood dry ? Yuan, Feng, Tuan, Chin, Hsu and now Wang, all the old gang of Peiyang militarists have held the reins of power by reason of their having been companions of a despot who broke the back of the republican movement in China through a loan that was not raised in Japan.

And let us be fair to those who forced through the re-organization loan against the repeated appeals of the South and go back, a few years more to 1909, when the new militarism was born in China through the imperial army program calling for 36 divisions (exclusive of the imperial guards of 30,000 men) of which eight were allocated to Peking and the metropolitan province, and,

with the exception of the guards, under the direct command of Yuan Shih-kai. There was no talk at that time of Japan being responsible for this new departure, in fact, it was hailed as a sign of progress with all European powers intensely interested in a movement which provided unusual opportunities for the sale of arms, munitions, equipment and machinery for arsenals. At that time Japan was not a serious competitor in this field of modern industry. The impetus towards militarism came from an entirely different quarter, with Germany getting the lion's share of the orders for army equipment and Great Britain bagging the plums for the new navy. There was no criticism at that time about any one nation being responsible for China's new militarism, only the squabbles as to who would obtain the orders. Japan was not one of the squabblers.

Outside of Li Yuan-hung, from Chang Piao's southern army, and Chang Tso-lin, the bandit of Manchuria, the oligarchy of Peiyang generals (followers and sworn brothers of Yuan), have reigned supreme either directly or indirectly through their puppets. The power of the old Peiyang group has never been broken and when Yuan became dictator and was furnished funds from abroad which cemented his position, it became impossible to pry loose their hold on the nation. Japan was not responsible for the growth of the power of this clique. The responsibility rests squarely upon the shoulders of whoever was directly responsible for ignoring the protests of the Kuomintang and supplying Yuan Shih-kai with the 25,000,000 pounds sterling which enabled them to solidify their position, hound the parliamentarians out of Peking and give the *coup de grace* to the republican movement.

True, it is, that Japan loaned the millions during the war which enabled this flock of vampires to fatten themselves upon a helpless people, but it was not Japan who created and made the situation possible. Would Mr. David Fraser have us believe that as long as the British government favored and supported the military despotism of Yuan that the world should applaud, but when Japan carried on during the war and loaned the funds so the system might be perpetuated, that she is to be held up to the bar of world opinion as solely responsible for the present situation ? Japan may have been responsible for prolonging the system, but she did not create it. Why, then, pick on Japan ?

The Story of "The Two Japans"

Northcliffe continues to harp on the threadbare story of the "Two Japans," in which the militarists are censured for their failure to live up to treaties entered into by the responsible government. This story has served its purpose in the same manner as it was employed to turn world opinion against Germany. The Japanese have been quick to sense where all this hostile propaganda was leading the nation. Sure, there are two Japans, as there are two Americas, a double-faced Britain and a Jeckyl and Hyde France, which takes the form of a constant conflict of opinions between the civil and military authorities in order to hold the reins of power, wherever an army of occupation in a conquered or occupied country in essential to stability. It is superfluous to cite incidents in support of this statement.

In this respect there are two Britains, and in like manner we have two distinct cleavages in present-day France, where for the moment the military are on top dictating the policy of the government. In America, in Great Britain, in France, as elsewhere, the militarists justify their flouting of the civil power on the high grounds that national or imperial defense imposes this duty upon them, that the civil authorities have no conception of how to treat subject peoples who accept all concessions as a confession of weakness. And here they differ in no respect from the Japanese militarists who insist that had they relaxed their vigilance and handed over full control of the government to the cabinet, the nation would have fallen a prey to some stronger predatory power.

It is correct to say that there have been two Japans; it may be that the power of the militarists still endures, but it is also a fact patent to all impartial observers, that the Japanese militarists have had their day and from now on the policy of the government will be dictated by the business element. It certainly will not strengthen their hands or forward the cause of liberalism in Japan to start anew a propaganda against the militarists. If Japan is to fall into line with the nations of the West, her liberals must receive support, sympathy and encouragement. To reopen a dead issue, in order to discredit their nation and hamper its legitimate trade aspirations is certainly not conducive to amicable relations or harmonious co-operation. Give the liberals and business-men of Japan their chance. They can be depended upon to put their militarists in their proper place if not nagged and ragged by unfriendly foreign criticism. To those who persist in holding up the picture of the "Two Japans" as proof of the existence of a dual government in that empire, it might be well if they read more carefully the current history of other nations. They would perhaps become convinced that they themselves were dwelling in very conspicuous glass houses. Why throw stones at Japan ?

Japanese Propaganda

Northcliffe then comes back to the worn out fable about Japanese propaganda and says :

"When calling attention to any matter that affects Japan we have always to remember that hourly, daily, weekly—morning, noon, and night—Japanese propaganda is at work in the form of bribed newspapers, propaganda news agencies, propaganda plays and propaganda films, and that quite a considerable amount of this propaganda has been widely diffused in Great Britain and the United States."

"The controller of a Far Eastern news agency said to me: "I had some experience of the German propaganda before the war, but the Germans are infants in arms in comparison with the Japanese." That was also my own personal experience."

This makes most interesting reading. Now let us analyze it and keep in mind other pertinent facts. Northcliffe concurs that in the matter of propaganda the Germans are infants in arms in comparison with the Japanese. That is a tall statement. During the war the allies got together and expended many millions ($12,000,000 by America alone) to counteract the German propaganda. They succeeded. The Germans afterwards very frankly admitted that their *moralé* was broken and allied victory made possible because the latter outdid them in publicity methods. Again, unless our memory plays us false, the Germans also very candidly admitted that the British publicity system was the most effective. At the head of Britain's publicity organization stood the owner of *The Times*. If this be true, then Foch, Pershing, Haig and Diaz are overshadowed by the real hero of the war, the master mind of British propaganda, Viscount Northcliffe.

Yet here we have the king of British propaganda handing over his crown and scepter to some obscure person in Japan. Now, it stands to reason that wherever organized propaganda exists there must be some directing genius, who sounds the key-note for the agents of the system to work to. Yet Viscount Northcliffe fails to enlighten his readers as to the identity of this personage. Who is the master-mind that directs this brilliant Japanese propaganda ? He certainly is not British. Neither is he American. No editor of a foreign newspaper in Japan can lay claim to this honor which places him head and shoulders above Northcliffe. Who, then amongst the Japanese, has risen to a height where he outshines Hearst in America and Northcliffe in England ?

The time has arrived when the world demands something more than mere inuendo. What are the names of the bribed newspapers, the propaganda news agencies, the paid writers of the system which menaces the prestige of Northcliffe and his own organization ? Come out into the open, talk facts and give the Japanese a chance to defend themselves. It is easy enough to be a successful propagandist and sway the opinion of the English-speaking world when one owns the most important daily papers in the world. It is easy enough to damn a nation and a people, when they cannot answer back, when they have no press or mediums through which to present their views to the same audience.

There was some explanation to be found for the recent anti-Japanese campaign conducted by Americans; there is no good or sufficient reason to account for Northcliffe's outburst against Japan. Knowing that Japan cannot reply in her own press and has no way to make her voice heard throughout the English-speaking world, it is our candid opinion that Viscount Northcliffe is taking an unfair advantage of a people staggering under a great handicap. It is contrary to all ethics of the game, to that spirit of fairplay and sportsmanship inherent in the British character to jump on Japan at a time when her liberal element is striving to fall into line with the ideals of the West. Japan is entitled to have her side of the case placed before the world, she is entitled to more consideration in this respect that any other large nation because of her inability to properly defend herself against these attacks, and she deserves special courtesies and advantages from the press of an ally whose highest officials bear cheerful testimony to her willingness to shoulder her full obligations during the late war.

There is another side to the story that Northcliffe tries to impress upon his readers. If there exists a propaganda in Japan, we have failed to discover it. The only Japanese propaganda we have been able to locate in fifteen years, is one which has for its object: peace, co-operation, harmony and understanding between Japan and the United States.

Why Kick a Dead Horse?

It is not difficult to understand the trend of Northcliffe's propaganda. It is also easy to understand that it is his own fight; that he does not faithfully reflect the views of his government, or the bulk of British opinion. Northcliffe is probably accurately informed that public opinion in the United States is satiated with this persistent and unreasonable campaign to incite national hatreds, racial antipathies and provoke trouble. American opinion is aroused as it never was before. Our leading statesmen are openly advocating that the purveyors of false news be deprived of their citizenship, and it is not at all improbable that an official investigation will be made to probe into these movements and discover their real instigators.

In the welter of Far Eastern propaganda and the keen struggle to dominate the Chinese government and influence business for contending nationalities, it is sometimes difficult to speak for a whole community. But we can safely state on behalf of the entire international commercial community in Shanghai that the continuance of propaganda of the character now sponsored by Viscount Northcliffe can bring no permanent or beneficial results to those who must seek their future in this country. Business in China calls loudly for a respite from these acute campaigns directed against friendly nations. We need peace, harmony, co-operation and consideration for the other fellow's problems and troubles. We are all in the same boat in China. There is no nation entitled to accuse another of taking advantage of China, for the purpose of ingratiating itself with the Chinese. The Japanese may sport no halo, but there exists no empty pedestal erected to the savior of China, that any nation has the right to preempt. The line with bricks now forming behind Northcliffe and his lieutenants for throwing at Japan might be better employing in erecting an enduring edifice of international good-will.

The world will probably heed the warning of Northcliffe, and Watch Japan, but it will also Watch Northcliffe, and scan very closely the propaganda that is simply a revamp of old stuff that was forgotten at Washington. Why kick a dead horse, Northcliffe?

The Soviet's Holy War Against Britain

We invite attention to a little book just published by the Macmillan Company, entitled "*Russia in the Far East*" from the [illegible] of Leo Paslovsky. In this book we read as follows:

At the third international congress held at Baku in September, 1920, Zinoviev laid down the most important of the fundamental theses of the whole policy and program of communism in Asia. In his own words this policy is: "We are ready to support any revolutionary struggle against Great Britain . . ." The watchword under which this struggle was to be carried on was presented by him to the congress in the following form: "Declare a holy war against European imperialism, particularly against Great Britain."

Has Zinoviev's campaign progressed in the past eighteen months? Let British interests in China answer this for themselves. The facts should warn Northcliffe and his advisers that in denouncing Japan and playing hand in glove with Bolshevist agents, instead of enhancing British prestige in China they are acting as the pliant tools of a system whose ultimate object is the overthrow of British dominion in Asia.

This interesting and timely book also very tritely explains the Soviet policy towards China and Mongolia, making quite clear that while Russian propaganda is directed against Japan's continued occupation of Eastern Siberia, the Soviet is steadily absorbing the vast territory of Mongolia, doing unto China exactly what they bitterly denounce in Japan.

Bringing Japan and America Together

The opinions expressed by a section of the British press testifies to the adoption of an extreme pro-German policy and we find the *Manchester Guardian* jubilant over the cooling of British sympathy for Japan. This influences the *Tokyo Nichi Nichi* to remark:

"To rely on a country in case of need and put a slight on it when its help is not necessary has, it seems, become the common-place thing in the world's diplomatic circles. We cannot, of course, foretell how long the intimate relations between the United States and Great Britain will continue. But there is no knowing whether the two countries will not meet with the same experience as Great Britain and Japan has had since the severing of the bond of alliance.

"Perhaps history will repeat itself in the case of the Anglo-American friendship. Be that as it may, the preposterous sacrifices and concessions made by Japan have furnished the United States and Britain with unexpectedly great successes and satisfaction, diplomatically and strategically. In other words, what has cost Japan so dearly has promoted the friendship between the United States and Great Britain and dampened the cordial sentiments of the British people for Japan. What little Japan has gained at the conference is the establishment of good understanding between her and the United States. If the peace of the Pacific be preserved and maintained by the two countries, their friendliness and amity will grow more and more in the future.

"And, in the sense, Japan and the United States will come to be bound together either spiritually or materially and contribute immensely to the safeguarding of world peace and elevation of the status of human civilization and culture. The Japanese people who have been disappointed at the results of the conference had better entertain optimism for their future in the face of these fine and rosy prospects."

The *Nichi Nichi* is right. The picture painted by Northcliffe bears the imprint of a system familiar to impartial observers in this part of the world. America and Great Britain will remain close friends and allies, exerting their great influence and power for world peace and uplift. Japan has been brought into this new understanding for the preservation of our common policies in Eastern Asia. She will not fail her partners. Despite the vigorous campaign of Northcliffe for the abrogation of the Anglo-Japanese alliance, the British government lived up to the highest ideals of international honor in refusing to throw over Japan and isolate her until another satisfactory understanding was arrived at to take its place. Any attempt at this time to prolong the agitation against Japan will only defeat its object. The continuance of such an unwarranted and untimely campaign will tend to draw America and Japan closer together in a more perfect understanding. The "King of Propaganda" should realize this.

Geo. Bronson Rea.

River Conservancy in China

AN ANALYSIS OF COSTS

By Laurence Impey, C.E., A.M.I.M. & County Engrs.

THOSE who read my article on River Conservancy Work in the May number of THE FAR EASTERN REVIEW may perhaps be interested in a more detailed account of the work, together with some estimates as to costs.

The map appended shows one of the most dangerous stretches of dyke on the whole of the Han River, in my opinion, and I have had an opportunity of observing the work at the other places up and down stream fairly recently.

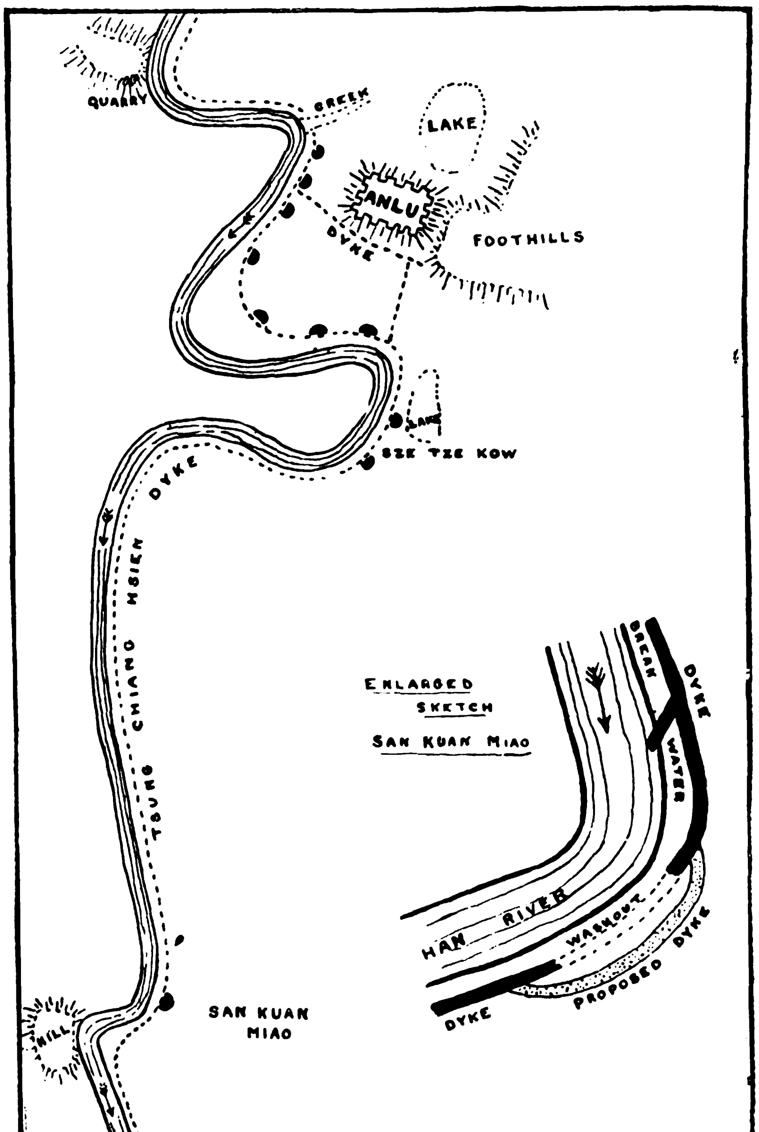
The figures I shall give will be taken from the work at Sze Tze Kow more particularly, as I can cost the accounts there more readily, and the work has a resident engineer, not being under a Chinese of the old regimé as it is at San Kuan Miao.

The total distance covered by the map, from the quarry above Anlu down to San Kuan Miao is divided as follows: Quarry to Anlufu, 5 miles, Anlufu to Sze Tze Kow, 10 miles, Sze Tze Kow to San Kuan Miao, 20 miles, a total distance of 35 miles.

It must be remembered that the quarry on the map is not the one from whence the stone for the work is obtained, that comes from a hill 14 miles further on.

The reason for the disuse of the first quarry is, I think, to be found in the old Chinese superstition anent "*feng shui,*" as underneath the hill is reputed to lie coiled a dragon which it were disastrous to disturb, and therefore some perfectly good stone is wasted, and the cost of the work considerably increased.

This hill, however, plays an important part in the formation of the course of the river, as it diverts the current at right angles and sends it crashing down upon the dyke just north of Anlufu, with results that are easily imagined.



Han River Conservancy: Anlu-Sze Tse Kow-San Kuan Miao Dyke Works

The dyke was broken in over twenty places last year, between Anlu and Sze Tze Kow, and only the secondary dyke shown on the map saved a great disaster.

As it was, the water inundated the area north of the city until it was held in check by the high ground and walls of the city on the one hand, and the foothills on the other.

A lake and a creek are the only souvenirs, now that the fl has receded, for the gaps in the dyke are practically all repai now, mostly by local endeavor, together with a grant from famine relief committee.

Formerly the river ran below the walls of the city of A itself, but for various reasons it has receded year by year, unti present it is no less than ei *li* (nearly three miles) away.

It is noticeable that all breaks occur at the end o stretch of water, where a sh bend in the course of the ri causes it to exert enorm pressure against the dyke such a spot; and I think I safe in saying that this proved the rule over the wl distance of three hundred n from Anlufu to Hankow.

As fast as the river w away one bank, it accumul sand on the other, thus sil up the old channel, a stat things that only a dre could remedy.

In passing, I would n tion one curious phenom which we have just obser which is that whenever freshets from the hills c the river level to rise the s bars seem to rise also, with result that our steamer practically no advantage f a rise in water level of perl eighteen inches.

I dealt last time with emergency methods which were employing to repair dyke, and I would call attention to the custom of time as exemplified in the v done by the Chinese at Kuan Miao this year.

The break, as illustr in the rough sketch, may said to have been caused l combination of circumstan

Firstly, you have the of a large volume of w bearing down on the dyke with a direct impact which it is sufficiently well protected to withstand.

Secondly, there has been constructed a breakwater, some dred yards above the washout, with the result that a dange eddy was formed, which probably did more damage in undermi the toe of the dyke than did the direct impact itself.

Within the break the new dyke, called by the Chine "*yueh tee,*" has been built, a method which they seem invari

to adopt, but which would not commend itself to engineering practice elsewhere.

It is certainly much cheaper and easier to build in every way, the other method requiring good foundations and piling, together with rock facing; but while one results in keeping the course of the river as clear and straight as possible, the other involves it more and more for every fresh break.

I am not able to quote any Chinese conservancy accounts from first hand auditing, but I append below the expenditures at Sze Tze Kow and other places under the famine relief commission roughly analysed.

Expenditures.	Per cent of Cost.	Notes.
Piles	20.8	ex Hankow.
Wire	.8	" "
Rock	23.3	ex Quarry.
Earth	25.0	
Sand	16.6	
Salaries and wages	4.2	Engineers, Accounts, Foremen.
Extra labor	.9	
Pile driving	3.4	
Bamboos	4.2	
Sandbags	.4	
Expenses, overhead	.4	
	100.0	

I purpose to give a few particulars as to the various items, the sources and application, together with data as to employment of labor, and comparison with previous Chinese work would be very informing if the material were available.

The piles used on the work were shipped up from Hankow by junk, and cost Tiao 5.0 apiece delivered on the job.

They average thirty feet, and are cut for twenty-two-foot piles, or twenty-five-foot piles, the surplus timber being used for the five-foot base piles, the cost of cutting being borne by the contractor, and to be covered by the price of driving.

Driving of piles is paid per foot of penetration, the average cost per pile working out at 850 cash.

The driving of the small base piles and the wiring to the main piles costs 120 cash per set of two main piles and one base pile, with forth-five feet of wire.

Two methods of driving are employed, the usual one with a driver and iron monkey, the other, a sort of frame placed on the pile itself, on which the driving crew balance themselves, and the pile being pounded into place with a stone rammer.

The rock used is sandstone, no other being obtainable unfortunately, and has to be brought down stream in boats, some difficulty being caused owing to the fact that the boatmen all want to avoid this class of work, and have to be drafted by the district magistrate.

The price is contracted to include transportation, and is Tiao 7.0 per *fong*, measured on the job.

An interesting sidelight is thrown on the prices on previous work in this area by the comments of various contractors after a week's work.

Several of them came and complained that they were losing money, the prices being lower than those quoted above, and when I objected that the contract fixed a price, they replied that on the government jobs they had supplied, say, eight *fong* of rock, and been paid for ten; or driven a pile five feet and been paid for eight, and cutoff the rest of the timber.

Earthwork was contracted on the same principles, the surplus being presumably divided between the contractor, the foremen, and the official in charge of the work.

Earth is costing about Tiao 3.0 per *fong*, and sand Tiao 2.0 per *fong*, the earth being brought in boats chiefly, and the sand carried in baskets and barrows.

Men, women and children are employed by the contractor, who uses a system of bamboo slips issued by his foremen for each load, and which are redeemable at the end of the day.

The price per load varies according to distance, from five cash to 15 cash being usual, and about 140 loads being carried to one *fong*, enabling a good worker to make 500 to 600 cash a day.

On the government work below men who are leaving tell me they could only make 200 to 300 cash per day.

Tamping and placing of earth is done by the contractor, in fact there is very little outlay on labor outside the ordinary contracts, some few coolies being used to place rock, and a few for extra wiring.

Bamboos are bought locally, and cost about 200 cash apiece, being bought by weight.

They are split into two or three pieces for weaving purposes, this costing 30 cash apiece, including splitting and placing, together with fastening down.

The Chinese system in the past has been to use bundles of reeds, but these rot very rapidly, though it remains to be seen how long the bamboos will withstand the wet either.

Sandbags have been purchased in large quantities, filled, and laid on the reverse of the dyke at the threatened points, in case the work does not progress sufficiently rapidly to enable it to be completed before the high water comes this year.

It must be remembered that the work has to be done with local labor, and that these men are farmers for the most part, who have to attend to their crops and planting at certain definite seasons, therefore it is very difficult to estimate on the amount of work that can be done in a given time.

The wages bill is small, as there work is contract work, and only four or five foremen and a storekeeper are necessary.

A Chinese accountant, a Chinese engineer, a foreigner supervising both, and the force is complete, with the exception of cooks and servants, a very minor item.

Money has to be brought up from Hankow periodically, so that the cost of a launch bearing money and supplies should be divided amongst the four or five jobs it serves.

It must be recognized that this is an emergency proposition, managed by amateurs, working against time, without proper preparation and the fore-thought necessary to the execution of such a project, and that it is also primarily intended as a famine relief measure, so that the usual surveys and engineering calculations are not available.

If this is remembered I hope and believe that some of the data may prove both useful and interesting.

New Harbor at Takoradi, Africa

The engineers responsible for the construction of the new harbor at Takoradi, Africa, have to face remarkably heavy excavations in rock, and to successfully undertake this work the use of mechanical excavators, of such rugged construction that they are capable of giving reliable and efficient service under very severe conditions, is essential.

It is eloquent testimony of British engineering that Ruston & Hornsby, Ltd., of Lincoln, have, in face of world competition, been instructed by the Crown agents for the colonies to supply three exceptionally heavy railway-type steam shovels to carry out the necessary excavations on this scheme.

These shovels are larger than any hitherto constructed in this country, the net weight of each being approximately 100 tons, bucket capacity 3½ cubic yards, a full bucket representing 8 tons of rock.

Szechuan Developments

THE following is the scheme for a railway project by Gen. Yang Sen, which has been handed by him to foreign Consuls at Chungking.

I. Railway

(1) *Chungking-Chengtu.*—As a first step towards encouraging the development of China's largest and most wealthy province and with a view to providing sufficient employment for the people, and extending trade and commerce generally, all of which tend to the maintenance of peace, and to an adequate supply of the raw materials now required by the world, the Szechuan government proposes to construct a railway—in the famous Red Basin—from Chungking to Chengtu (about 300 miles) with a view to a future extension to Tachienlu, the gateway of Tibet, the world-famous treasury—about another 250 miles.

(2) *Gauge.*—In view of the fact that the cost of constructing a standard gauge railway over a hill country like Szechuan would be very great, it is proposed to build a narrow gauge line, say 1 metre, something similar to the lines laid down in Shanshi. This and other technical points are, of course, questions for decision by experts when the time comes, and need not, therefore, enter largely into an outline proposal such as this.

(3) *Probable Cost.*—At this initial stage it is also impossible to form an exact estimate of the probable cost of such a railway; but for the sake of negotiating a loan the figure may be temporarily put down at from twenty-five to thirty million taels. The final figure, however, to be settled when estimates have been prepared by experts.

Loan.—The terms and conditions of the proposed loan to be discussed when, and if the loan is negotiable, in the name of the Szechuan provincial government.

(4) *Traffic and Present Freight Costs.*—Traffic along the proposed route is enormous, and the amount of freight which the Szechuan people have already shown their willingness and ability to pay is probably higher than that prevailing in any part of the world. As an instance of this the steamer freights from Ichang to Chungking (about 500 miles) may be cited. The cost of freight over this 500 miles works out at from Tls. 70 to Tls. 100 per ton.

Again, the overland transportation charges of cargo from Chungking to Chengtu are, at present, about Tls. 130 per ton (about 40 tael cents per ton per mile) and the transportation by river between these two places is roughly about Taels 15 per ton, the cargo being six weeks *en route*, and often arriving damaged by water owing to frequent wrecks. From these figures, therefore, it is safe to estimate the railway freight charges for the entire journey, Chungking to Chengtu and *vice versâ*, at about Taels 20 per ton, or about six tael cents per ton per mile.

(5) *Possible Revenue.*—In considering the possible revenue to be derived from such a railway as is proposed, the development of the coal, salt, rice and sugar industries must be taken into account, as well as the immense traveling population, which would always insure a heavy passenger traffic. With peace once restored to the province there would at once be a general increase of native exports and foreign imports. Besides all this the railway itself would naturally lead to the development of many new industries which would all tend to increase the income of the railway.

It would seem, therefore, safe to estimate the capacity of the railway at about 3,000 tons per day. This would be equivalent to 12 trains per day of 250 tons loads (passenger and goods combined, also the intermediate traffic included in the calculation) up and down the whole length of the line. Thus reckoned the tonnage per annum would reach the million mark, yielding a revenue of 20,000,000 taels. Even, therefore, from such a cursory glance, it will be seen that a railway between Chungking and Chengtu would prove to be a most profitable concern.

II. Coal Mines

It is becoming clear, even to the ordinary man in Szechuan that no real development can take place in the province unless an abundant supply of cheap coal can be assured. Coal is the key to the success of any and every enterprise; without it no modern industry can be made successful.

Realizing this to be a fundamental truth, it is proposed that together with the construction of the railway there shall be started an official mining department whose aim shall be to develop the coal mines along the line on modern lines and methods. The said mining department is to be combined with the railway in a similar way as that which prevails in the case of the South Manchuria Company.

For this department the government proposes to raise a loan of one million taels.

The prospects for such a coal mining concern can hardly be exaggerated, and the advantages are obviously manifold:—

(1) The railway itself cannot be run without coal, and it would be a short-sighted policy to build any railway without first making sure of the coal supply.

(2) The ever-increasing fleet of high power steamers plying on the Upper Yangtze are such enormous consumers of coal that already it is being realized that the old-fashioned methods of producing coal are incapable of meeting the great demand of the Upper Yangtze steamer companies.

(3) The development of coal mines will greatly augment the traffic on the railway, and will always prove a sure source of revenue.

(4) With the introduction of railway transportation facilities the price of coal can be considerably reduced.

The extent of this reduction can be appreciated by a consideration of the fact that now from 70 per cent. to 80 per cent. of the price is absorbed by the present antiquated methods of transportation. It is self-evident, therefore, that with modern methods of production sales will greatly extend. The comforts of the people would rapidly increase, and every household in Szechuan would soon be a consumer of coal. The fact that, in an immense territory like Szechuan with a population of 70,000,000, there is not a single modern equipped coal mine, is sufficient to prove the success of such a mining department as the government proposes.

(5) The development of the coal mines along the line of railway would speedily result in the establishment of many industries equipped with modern machinery such as:—

> Sugar refineries, textile manufactories, cement works, salt refinery, indigo works, flour, oil and rice mills, extension of silk filatures, woolen factories, paper-making factories, glass-making factories, tanneries, brick and lime kilns, hydraulic stations, electric light, waterworks, etc. etc.

for all of which factories the Szechuan province is able to provide the necessary resources. With such a railway once running and all these industries established Szechuan would be on the way towards being one of the richest countries of the world.

(6) The coal mines and the railway together with the consequent industries which will naturally follow, will more than supply work for the transportation laborers who may be affected by the introduction of the railway.

(7) Once the coal mines are well established other mines, such as iron, copper, silver, gold, mica, asbestos, antimony, mineral oil and spelter would soon follow for Szechuan possesses all these materials in great abundance.

(8) A daily output from the beginning of 1,500 tons of coal would mean half a million tons in the year. On this the profit realized would amount to Taels 750,000 calculating the profit at Taels 1.50 per ton. It is obvious, therefore, that the development and prosperity of Szechuan depends more upon coal than almost any other article.

The An-shan Iron Mine District, South Manchuria

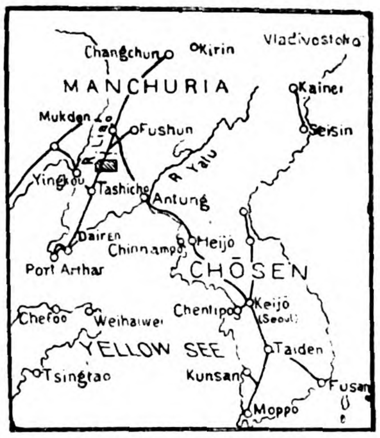
By Hanzo Murakami, Geologist to the S.M.R. Co.

View showing the contact between the green schist and quartzite; the hematite-quartz-schist is not found there (Hsi-an-shan mine)

1. History of the Iron Ore Industry

THE Russians, when laying the railway from Harbin to Dalny (Port Arthur) had no inkling of the An-shan iron belt, in spite of the fact that the railway track crosses the middle of it, and on account of the low grade of "the iron-containing rock," they used it only for railway ballast.

In the year 1909, the geological survey conducted by the South Manchuria Railway Co. established the true value of iron ore at Tieh-shi-shan, literally meaning "the mountain of ironstone." Generally, the Chinese geographical names tell something about the geological peculiarity of the place. After the discovery of Tieh-shi-shan, this company continued to explore the district more and more, and had a delightful surprise at discovering the wonderful distribution of the iron; and now a fairly definite idea of the general distribution of the ore is known. This iron wealth lay neglected for a few years, partly because of the difficulty of acquiring the necessary concessions and partly because of the low economic value of the ore. During the war, the necessity for a local of iron in Japan was strongly recognized, and by May, 1919, two blast furnaces, with a capacity for 250 tons a day each, were completed in An-shan.



Map showing the location of the iron mine district of An-shan, South Manchuria. Shaded area indicates the iron district

When mining was started, it was astonishing to find many openings which no doubt once served as pits, excavated by primitive methods having a depth of about 60-ft. from the surface. Evidently this ore was mined in ancient times. It seems that the above depth was probably the maximum attainable, on account of the occurrence of water, bad ventilation, etc., when gunpowder or other modern devices were not available. Moreover, many pieces of old slag with charcoal and bones of mammals, employed for smelting purposes, were found.

From "The History of the Liao Dynasty, Vol. 60," written in Chinese, one may infer that the primitive mining above mentioned dates back about a thousand years, and that Tai-tsu, the founder of the Liao dynasty, took no little interest in mining work, especially in iron smelting, in the years 616-721, or in the Shen-tse era. It is recorded also that there was, at that time, a tax collector's office for levying taxes on the iron work at Liao-yang, 15 miles north of An-shan, known by the name of Tung-ching and that the tax was paid in iron produced.

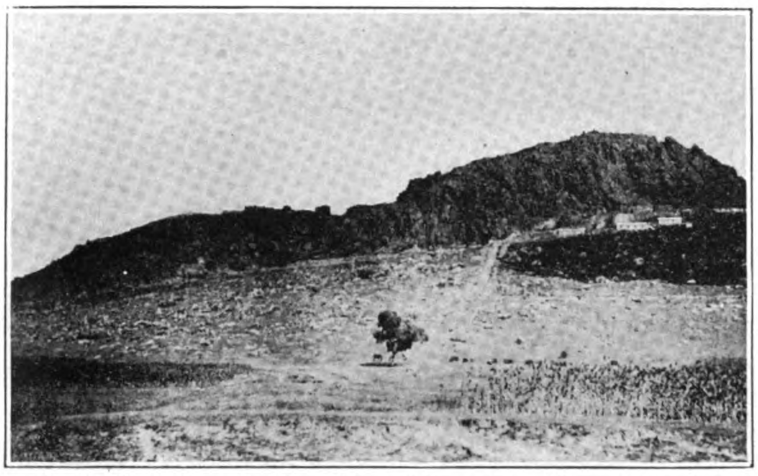
In this connection, on Shou-shan, 9 miles north of An-shan, popularly referred to by the natives as Shou-shan, because the Chinese character has the same pronunciation, a blast furnace was constructed, surrounded with about 300 houses for the residence of those engaged in smelting and mining industries. From these data, we may gather that the mining in the vicinity of An-shan was very prosperous in ancient times.

II Topography

Any traveler who is going to Dairen southward from Mukden will find that the eastern side of the railway is a mountainous region, while the western side is an extensive plain with no remarkable mountains or hills. This is the reason why the railway runs along the great tectonic line through South Manchuria trending NE-SW, and the plain on the western part is the effect of the depression along the great fault and includes a wide lowland, through which the great river Liao runs. In the An-shan district, however, there are some traces of erosion relics even on the western side of the railway, though they are not remarkable when compared with the mountainous area in the eastern part of this district.

The geology of the An-shan district is comparatively old, because we cannot find any sedimentary or igneous rocks younger than the Cambrian. The crust has undergone severe denudation in the course of long ages. The present topography of the An-shan district has resulted, to a very large extent, from the differential erosion of rock formations, which offer varying resistance to the processes of degradation (Plate 1). The ridges, generally, tend to be flat-topped, and separating the various valleys from one another, they remain now the plateau of erosion or relic mountains. These uplands stand on the quaternary lowland just like an island in a great ocean.

Such a recent deposition as the glacial drift of the Lake Superior district in the United States of America, to which I have already



1. Typical view, showing differential erosion. The rock forming the cliff is the hard hematite-quartz-schist; while the slope is the soft green schist. The boundary between these two rocks is seen by a line in the figure.

2. Panoramic view of Chien-shan granite, taken from a detached hill, 6 kilometres to the west.
The characteristic features in the foreground can be easily distinguished from the formations of the range in the distance

alluded, cannot be found in the An-shan district, but we find some deposits of loess of æolian origin as the counterpart of the drift.

The exposures of the several formations are very distinct owing to the steep dips of the strata and the sparseness of the vegetation. This is very convenient, for field work and underground methods such as boring, are not required. The reason of the scarcity of vegetation in Manchuria is the ruthless deforesting and negligence in replanting rather than the aridness of the district: the precipitation in the year 1919 amounted to 429.5mm. in Dairen and 615.5mm. at Mukden.

The topography of the mountains can be classified into the four following types according to the structure of the rocks:—

(1) Chien-shan granites are distributed over the southern end of the district and develop abundantly in this direction, as may be seen on the map. They form, in general, erosion relics, the surface of which is more or less irregular, zigzag, ribbed and knotted. The height of the Chien-shan granites is estimated at about 550-600 metres above the level of the plain. The beautiful scenery of Chien-shan (Plate 2), commanding a view of the surrounding lowland of the Liao plain, was an object of veneration by the vatives from time immemorial, just like Mount Kongo (Diamond Mountain) in Korea.

(2) Hard and durable rocks, such as the hematite-quartz-schist and quartzite, stand out as mountains because of their persistence after erosion and denudation; the strike of the strata coincides more or less closely with that of the range. As seen on the geological map in this paper, these durable rocks are arranged so as to make a right-angled triangle with the railway as one of its sides; the average height of these mountains is about 200 metres above the plain.

(3) The gneissose granites rise to a height of over 200 metres. The distinction between the Chien-shan granite and the gneissose granite is that the ridges of the latter are flat-topped, being transformed into the undulating uplands. A study of such a plateau suggests to us that a chain of original mountains, after it has suffered much denudation, may afterwards again be uplifted to such a height as before (Plate 3).

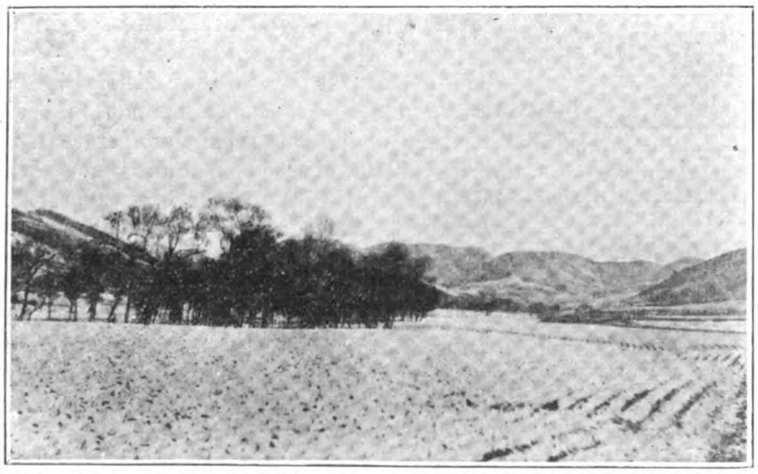
(4) In the course of long ages, the plateaus of granite pegmatite and other related rocks have suffered extensive denudation. They have been trenched and furrowed by many valleys to such a degree that they are hardly recognizable as table lands; their original plain-like character being nearly lost. They are transformed into regular ranges or irregular groups and masses of relic mountains. So the distribution and relation have been determined only by the nature and the attitude of the constituent rocks.

The drainage system in the district is comparatively simple. The Sha-ho or Chien-shan-ho in the northern part, and the An-shan-ho in the southern part, are the drainers of the district. Both rivers, after running westward for about 30 kilometres, make a typical meander and join the Hun-ho, which runs along south of Mukden and discharges into the great river, Liao-ho. Steep-sided valleys with many cliffs characterize these rivers. The formation of cliffs is probably due to several causes, such as concentrated rainfall, scarcity of vegetation and a surface deposit of very fine loess. It is recorded that at Dairen 64 rainy days occurred in the year 1919, and 73 days at Mukden in the same year.

DETAILS OF EACH MINE

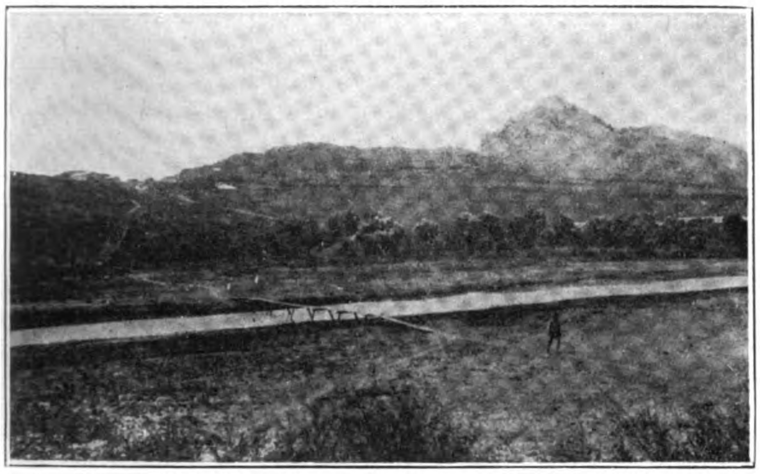
(1) Hsi-an-shan (West An-shan) Mine (Plates 4 and 5)

Hsi-an-shan mine is located between the station of Chien-shan and Tang-kang-tzu, being ouly one mile south of the former station.



3. Scene of erosion plateau of the granite, looking north-ward 3 kilometres

3. View of Ping-shan, rejuvenated peneplain, looking northward 3 kilometres



4. View of the Hsi-an-shan mine, taken at a distance 1 kilometre northward. The river is the An-shan-ho

5. Peak, situated in the most eastern part of the Hsi-an-shan mine, taken from the northern slope

This is the most convenient location for the inspection of the An-shan iron deposits.

Although the highest peak is only 260 metres above the ground, Hsi-an-shan stands conspicuously with its characteristic features of rugged outlines, brought into higher relief amidst the surrounding lowland. The range is formed of three groups, the western, middle and eastern with the respective heights of 260,230 and 107 metres. They extend from east to west ; the eastern end is cut by the river An-shan, along which the South Manchuria Railway and the main road run.

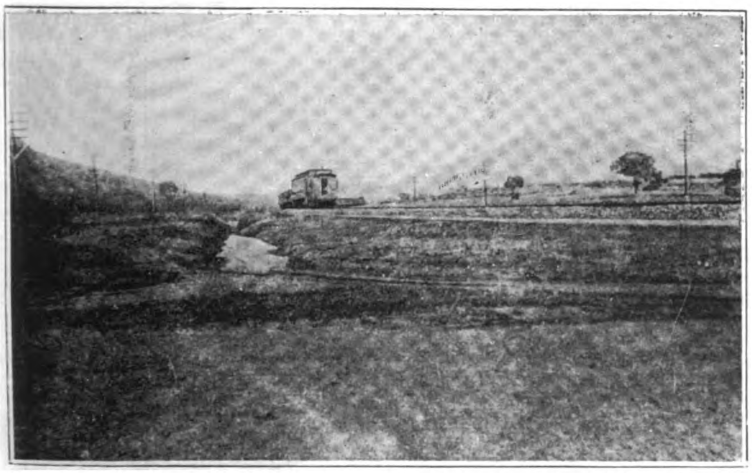
The prevailing rocks of the district are the green schist complex, hematite-quartz-schist, quartzite group and granite. The green schist complex consists mostly of slate, phyllite, sericite-schist, and talc-schist. The phyllite resembles in appearance a fine crinkled silk crêpe with undulating curvatures developed by severe dynamic pressure. Staurolite was probably once present, judging from a hollow looking just like a crow's foot. Sericite-shist and talc-schist are distributed locally near the zone of contact with the igneous rocks.

The hematite-quartz-schist controls the surface feature of the land, making an extremely rugged knob, due to its strong resistance against weathering. Its thickness measures generally above 40 metres. The quartzite group is made up of quartzite proper and siliceous slate, distributed widely on the northern side of the range and follows the slope of the surface. The quartzite frequently shows ripple marks and reveals the fact that it was formed in shallow water. Under the microscope, the rock shows general uniformity in size of quartz grain, and a nearly entire absence of any mineral other than quartz, except minute flecks of chlorite and magnetite. This purity is the result of sorting, which has caused the particles of other minerals to be removed, leaving only quartz grains. Secondary enlargements of the quartz grains are noticeable, under the microscope. Conglomerate measuring 0.15—0.3 metres in thickness overlies the hematite-quartz-schist ; its fragments are angular hematite-quartz-schist and round grains of milky quartz, cemented by sandy hematite. On the lower northern slope, there are found the most recent deposits consisting of loess of a maximum thickness of 12 metres.

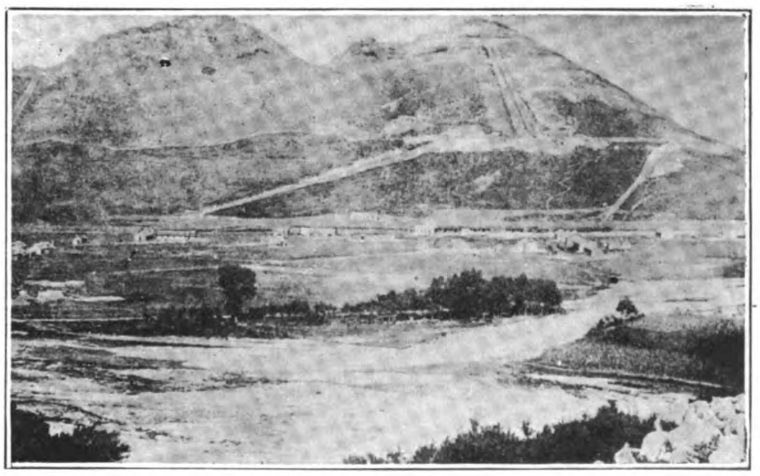
Granite is locally exposed on the southeastern slope of the range in contact with green schist. The prevailing minerals of the granite are pinc orthoclase, quartz and a small amount of muscobite. The granite shows more or less foliation, dipping to the north, and in it some quartz veins are exposed on the same slope. Some green schist in contact with the granite is metamorphosed to sericite-schist with much abundance of spotted quartz of 2-3mm. in size and the other is changed to conglomerate-schist which gives a minute aggregate of quartz and chloritoid with embedded quartz porphyritically.

Turning to the tectonics of the district, the great thickness of the green schist shows several undulations of the stratum with a gentle dip of from 10° to 30° and is conformably overlaid by the hematite-quartz-schist. The dip of the hematite-quartz-schist varies from 30° to 60°, underlying a thick seam of the quartzite, which gives generally a gentle dip of below 30°, and we can detect clearly the presence of unconformity between these two strata, judging from the occurrence of conglomerate, in addition to much difference in the dip angles. The contact metamorphic effect of the granitic intrusion into the green-schist is evidence of the early Cambrian age of the intrusive. The prevailing joint cracks in the hematite-quartz-schist are N 20°-30° E, dipping 60° southeast.

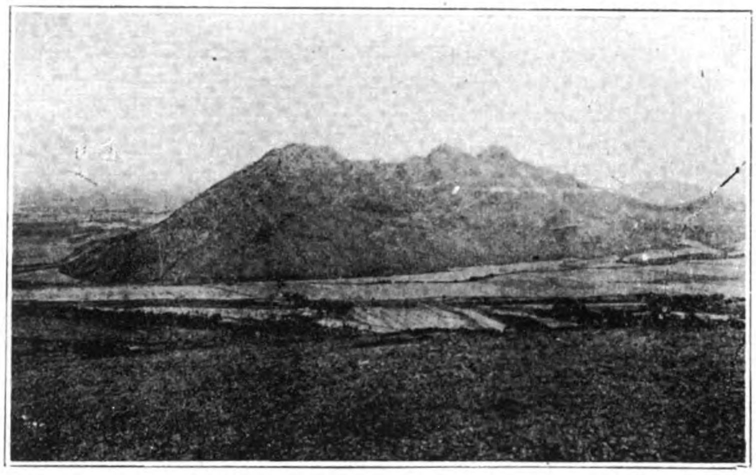
More or less high grade ore of primary origin has been worked in the eastern part of this mine, but the richer ore of the secondary origin is now much sought after. Some secondary ore has been found in the contact zone of the foot wall or hanging wall of the



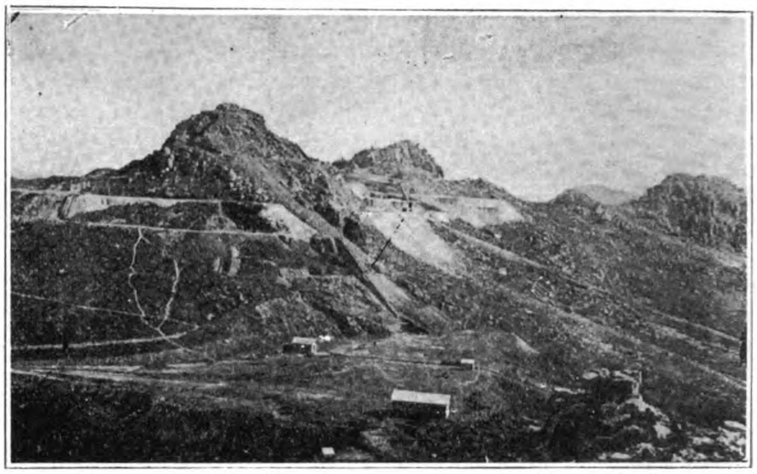
6. Southern view of Tung-an-shan (right-hand side) and Hsi-an-shan (left-hand side), being crossed by the main line of the South Manchuria Railway Co. as seen from a distance 4 kilometres southward



7. Southern view of the Ta-ku-shan mine, as seen from a detached hill, 1.5 kilometres west



8. View of the Ying-tao-yuan mine, looking westward from a granite hill



9. Open work of the Ying-tao-yuan mine; only the enriched parts being mined, looking southward from No. 1 pit

hematite-quartz-schist, that is, on the green-schist or under the quartzite, forming the platy veins with an average width of 2 metres, but frequently pinching and swelling. Recently, it is reported that at the western end of the district, they have found rich ores formed in gashes of the hematite-quartz-schist, due to the great flexture.

2. Tung-an-shan (East An-shan) Mine (Plate 6)

Tung-an-shan mine is located adjacent to and east of the Hsi-an-shan mine and is cut at almost right angles by the river An-shan. The highest point of the Tung-an-shan is about 330 metres above the sea level, and it presents a commanding appearance in comparison with the surrounding level plains. From the top, one ridge runs northwest, and another eastward, and the southern slope of the mountain is generally steeper than the northern, this being due to the difference of the constituting rocks.

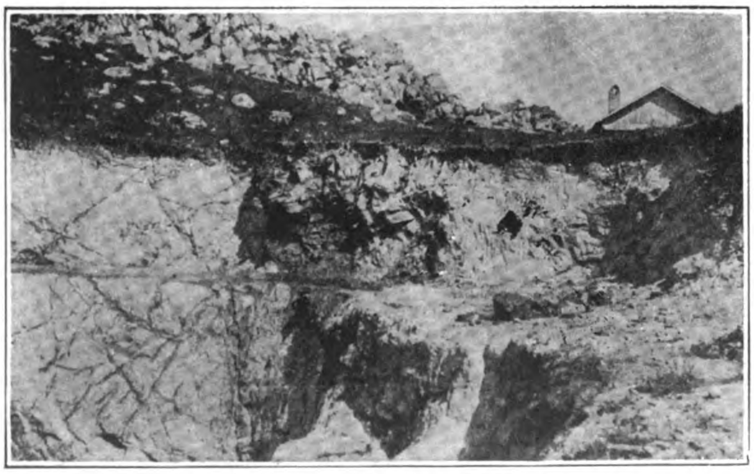
The main rocks are green-schist, hematite-quartz-schist, conglomerate, siliceous slate, quartzite in sedimentaries and granite in igneous rock. The green-schist complex are made up of sericite-schist and phyllite exposed in the higher parts of the southern and southwestern slopes of the mountain. The hematite-quartz-schist stands out on the prominent ridge; its position being due to its great resistance to weathering, and it is not difficult to distinguish its boundaries from other rocks, but at the east end, the quartzite overlies the hematite-quartz-schist making it difficult to tell the boundary.

The hematite-quartz-schist of the Tung-an-shan mine possesses greater fissility than that of the Hsi-an-shan. The conglomerate is well exposed and has commonly a width of 0.3 metres, but on the eastern cliff of the highest point, it swells locally to 2 metres and is frequently worked, because it contains iron to an extent worth tapping. The pebbles in the conglomerate are the round grains of secondary quartz and fragments of the hematite-quartz-schist cemented with the iron oxide in the form of alluvial sand. It is noteworthy to find talus deposits of the hematite-quartz-schist in the northeastern slope of the highest point, and some of them are mined as ore.

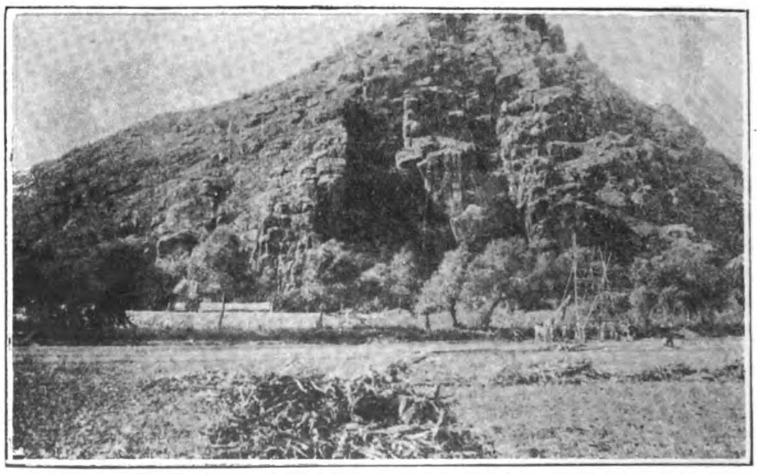
As a Cambrian base rock, the siliceous slate lies unconformably upon the hematite-quartz-schist and is underlaid conformably by the thick seam of the quartzite. It is exposed along the river bank and has commonly a reddish purple color, this being due to its containing iron oxide. In this siliceous slate, hematite-ore occurs to a width of 0.3-1.0 metre in the bedded form, but it is much restricted in quantity owing to its irregular distribution with the intervention of discontinuity at several points, which deprives it of commercial value.

The quartzite widely predominates to a great thickness on the northern and northeastern slopes of the mountains, protecting the several older and underlying seams above described. Ripple marks are frequently found in the quartzite. Granite occurs at the base of the hematite-quartz-schist on the southern slope in contact with it, sometimes directly and sometimes indirectly, in the latter case intercalating a thin seam of the green-schist. The rock is of a coarse structure constituting mainly pink orthoclase and quartz with slight flecks of muscovite; the weathering of the rock is so advanced as to make it impossible to get a fresh specimen.

As regards the tectonics, the hematite-quartz-schist strikes N45°-60°W and dips steeply above 50° to the northeast; especially on the cliffs along the river it forms above 75° and is nearly vertical in places. It need not be mentioned that the green schist occurs parallel to the hematite-quartz-schist. The strike of the quartzite is nearly parallel to that of the hematite-quartz-schist, (from north-



10. Showing the enclosure of a part of the hematite-quartz-schist in the gneissose granite (Ying-tao-yuan mine)



11. View of a cliff of the hematite-quartz-schist, formed by a transverse valley, measuring 140 metres in width. (Wang-chia-pu-tzu mine)

west to southeast), but it dips at a very gentle slope below 40°, and it is certain that the contact marks an unconformity ; this is further substantiated by the occurrence of the conglomerate.

The intrusion of the granite dates later than these sedimentary rocks, judging from the intrusion into the green-schist, and in the neighborhood of the present river some masses of the hematite-quartz-schist seem to have been pushed forward by severe eruptions of the granite magma. The granite has a schistosity NW-SE, following the common direction in the An-shan district, due to the deformation suffered.

The occurrences of secondarily enriched ores in the Tung-an-shan mine intercalating amidst the hematite-quartz-schist to a width of 1.5 metres and usually accompanied by some porous limonite. Frequently, along a local fault plane, the hematite-quartz-schist is broken into fine pieces, and the schistosity disappears owing to the great friction, forming an enriched limonite of extremely loose structure.

3. Ta-ku-shan (Plate 7)

Ta-ku-shan mine is located 12 kilometres southeast from the An-shan station and is connected with it by a branch railway for the transportation of the ore. The base of the hill is 43 metres above the An-shan station. "Ta-ku-shan" literally means a prominent solitary mountain. It may be seen from a distance, rising about 180 metres above the surrounding alluvial lowland. The long axis of the mountain extends northwest-southeast, and the north-eastern side is less steep than the southwestern, due to the differences in the rocks. It is dissected into two parts along a fault. The eastern part rises 290 metres above the track level, and the western part is a little lower.

The rocks are green schist, hematite-quartz-schist, quartzite, granite and diabase. Green schist in considerable thickness occurs overlying the hematite-quartz-schist. In the green schist formation, staurolite-phyllite and chlorite-schist are the most common rocks. Green schist exposed at the foot wall of the hematite-quartz-schist is generally very thin, intercalating frequently in the iron formation.

The hematite-quartz-schist constitutes the essential part of the mountain and forms an extremely rugged knob which is common in the district. Its fissility and its distinct magnetism are the noteworthy characteristics of this mine. It is also noticeable in this mine that the hematite-quartz-schist contains much actinolite besides a small amount of siderite, calcite. The hematite-quartz-schist has been worked as a primary ore to the total amount of about 80,000 tons since 1918. The average grade of the hematite-quartz-schist in this mine is about 35 per cent. to 36 per cent. of iron.

The quartzite occurs overlying the green schist, and frequently contains much iron oxide, but not enough to make it of commercial value. It is called ferruginous quartzite to distinguish it from the hematite-quartz-schist. In the Kuan-mien-shan mine, about 8 kilometres east of the Ta-ku-shan mine, ferruginous quartzite occurs above the hematite-quartz-schist, with a thick seam of green schist between them, just as is the case with the Ta-ku-shan mine.

The intrusive rock developes on the southwestern slope of the mountain, intruding the green schist (Fig. 5) and it is not difficult to detect the boundary with the other rocks by the surface feature, because of its ready erosion, although the exposure is generally very bad. The rock shows a distinct schistosity. It is composed of pink felspar and fine flecks of muscovite accompanied frequently by green dyke rocks and quartz veins. Judging from occurrences and its mineralogical characters, the rock seems to be a variety of the gneissose granite.

In the hematite-quartz-schist, the strike is E-W on the west side, and varies until it becomes N 70° W on the east side. The dip varies from 45° to 70°, always towards the north. On the southern slope of the mine, we found severe contortions of the strata suggesting a great synclinal structure of the hematite-quartz-schist.

The green schist strikes just the same as the above stratum, dipping over 70° towards the north. The direction of the schistosity of the granite is nearly parallel to the hematite-quartz-schist ; this means that the mountain making stress was later than the eruption of the granite. Besides the great fault in the central part, several minor parallel faults are seen in the hematite-quartz-schist, crossing the strata at nearly right angles, through which some minor intrusions of diabasic dyke rocks occur.

The formations of the secondarily enriched ores are accompanied by limonite and milky quartz of open texture. In the western part, the ores are found upon the impervious bed of the green schist, while in the eastern part, they occur in a cavity formed by a local flexure. The ore-bodies vary in size, sometimes assuming a tabular form with a width from 1 to 2 metres. They assume in rare cases the form of an irregular round mass swelling to 5 metres in width, and from one body there could be mined as much as 500 tons, it being often possible to produce above 1,000 tons. The hematite-quartz-schist of the Ta-ku-shan mine often has a sufficiently high content of iron, that it can be worked for commercial purposes.

4. Ying-tao-yuan Mine (Plates 8 and 9)

The Ying-tao-yuan mine is located 12 kilometres due east of the An-shan station, but the railway line for the transportation of the ore runs around the north side and is more than 15 kilometres in length. This mine is situated in the northern division of the An-shan iron district, and the highest peak rises to an altitude of 150 metres above the surrounding alluvial plain. The range of the mine runs from NNW to SSE parallel to the strike of the hematite-quartz-schist, which constitutes the main part of the range.

The hill, in which the Ying-tao-yuan mine is situated, is formed of green schist, hematite-quartz-schist, quartzite and granite with minor diabase intrusions. The hematite-quartz-schist contains mostly a low percentage of iron, having never been worked. Only the secondary ores are mined. In the northern division of the Ying-tao-yuan mine, there occur secondarily enriched bodies, formed at the contact with the granite mass, accompanied by schists containing : scaly flecks of phlogopite, "devil's pyrite" and fine crystals of magnetite, etc. Some chlorite-schist seems to be formed from the hematite-quartz-schist, at the contact with the granite. Metamorphism due to the contact action is restricted to a comparatively small area, and the hematite-quartz-schist, a short distance from the contact, remains as poor ore.

The green schist has several phases ; it is constituted of phyllite, chlorite-schist, sericite-schist and diabasic rock. The quartzite is predominant in the northern part of the district, and also locally remains overlying unconformably the hematite-quartz-schist. It frequently contains sericite. The intrusive rock is distributed abundantly in the north and northeastern part of the district. It is constituted mainly of pink felspar (orthoclase ?), microcline and quartz with a very small amount of black minerals. The rock is a acidic granite, judging from the chemical analysis (page 19). In the peripheral part of the granite, there appear muscovite and talcose felspar of indistinctly granular structure. Beside the granite, some traces of other diabasic intrusive rock could be detected in the northern part of this mine.

Reviewing the tectonic of the Ying-tao-yuan mine, the original arrangements of the hematite-quartz-schist and the green schist have been broken into pieces by the severe dynamic action due to the intrusion of granite magma (Plate 10). In the northern half of the hematite-quartz-schist, the strike varies from northwest on the north side, then turning northward, to northeast on the south side, and the dip varies from 55° to 75° always toward the west. It is nearly vertical on the cliff at the southern end.

It is noticeable that no green schist occurs in the foot wall of the hematite-quartz-schist, probably having been swept away from the place by the intrusion of the granite. In short, the great intrusions of the granite into the hematite-quartz-schist will tend to enhance the high grade of the secondarily enriched ores.

5. Wang-chia-pu-tzu Mine (Plate 11)

The Wang-chia-pu-tzu mine adjoins on the south of the Ying-tao-yuan mine, forming the boundary line with the valley Chi-chia-kou. The axis of the deposit runs from northwest to south-east. The hill is as usual composed mainly of the hematite-quartz-schist. The mine-lot is separated into three divisions, No. 1. No. 2 and No. 3 being divided by small valleys from the southern end, while No. 3 rises most prominently, being 230 metres above the An-shan station.

The rock of the mine is formed of sedimentaries such as green schist complex and hematite-quartz-schist with granite as an only intrusive.

The green schist complex is composed of diabase-tuff, hematite-schist and chlorite-schist at the foot wall of the hematite-quartz-schist, and sericite-schist and sericite-quartzite at the hanging wall, as seen on the geological map. The hematite-quartz-schist is the prevailing rock in the district, measuring 140-170 metres in breadth, but due to a low iron content, it has not been used as ore.

The ore mined is all of a secondary origin, being formed at the contact between the hematite-quartz-schist and the granite, intercalating commonly thin layers of green schist. On closer observation, there are found the alternation of Lematite-quartz-schist and several kinds of ores, of which we can distinguish three kinds ; compact ore, banded ore and ore associated with the green schist, while there are gradual transitions between the compact and the banded ore with accompanying pyrite and milky quartz. The ore associated with the green schist is formed by the admixture of iron oxide and green schist, to such an extent that the percentage of iron reached a commercial value, but the last is a rather rare case with the ores of the An-shan iron district. The breadth of the ores varies 0.3-4.0 metres, always occuring parrallel to the strike of the hematite-quartz-schist. (Plate 12-13).

A variation of the breadth of the ores is seen at a rather short distance, the ore being frequently found in irregular round masses. Judging from the occurrences and the allied minerals above described, the formation of the secondary enrichment seems to belong either to a contact metamorphism between the granite and the iron formation or to the action of the descending meteoric water. In this mine, we often find some rich porous ore of weak structure, due to the process of the leaching of silica, leaving the ore as residue.

Mining in Shantung

IN Shantung metallic and non-metallic minerals of many kinds are to be found in great abundance.

In the eastern part of the province, which is near the sea, most of the minerals are metallic; while in the west, bordering on the provinces of Chihli, Honan and Kiangsu, the minerals are mostly non-metallic. Among these coal figures foremost.

The general conditions of mining of the province are as follow :

Gold is very important among the metallic minerals. The gold mine in the Lo Hill of Chaoyuan district is the most notable, and its vein covers several *li*. Twenty years ago it was abnormally productive, but recently it has gradually declined.

There is also a famous gold mine at Ju Tien, in the district of Pingdoo, that has been worked for 300 years. The total value of the minerals taken out at intervals amounts to at least $10,000. There is a gold mine at Weihaiwei, in the district of Wenteng. It is a British enterprise, and belongs to the Wei Hai Mining Company, but it is said to be unprofitable. There are also large amounts of gold dust in Fushan, Ninghai and Mao-ping. Also there are mines exploited by old methods in Lingchu, Anchiu, Poshan, Ishui and Chu-Hsien.

According to the reports of the geological survey of China of the ministry of agriculture and commerce, the amount of gold in Shantung is 2,600 ozs., and occupies a mineral area of 332 *mow*, and the whole area of developed mines of all kinds is 477 square *li*.

Copper, Iron, Lead and Tin

The province has silver, copper, iron, lead and tin. The largest copper mine is that of Tao Shia-chwang, in Licheng. It is developed by Mr. Chu, conjointly with a Japanese company. The largest iron mine is that at Ching Ling Chen, in Itu. There is magnetite, limonite and hæmatite in this mine, and the Germans formerly had ambitious plans with respect to it. It now belongs to the Shantung Railway, and is owned entirely by Japanese. It is reported that the quantity of iron in this mine is 14,000,000 tons. The magnetite at Ching Hua Sahn, in Peng Lai Shan, and the hæmatite mine at Au San Kao, in Che Hsien, are also well known.

As to lead, Pingdoo and I Hsien have the largest quantities. There are tin mines in Lingchu, Chu Hsien and Che Hsien. There are also small quantities of quicksilver and arsenic.

As to the non-metallic mines of this province, the principal ones are coal, quartz, clay and quartz crystal. The largest coal mines are in Wei Hsien, Fangtse, Tsechuan, Hung San and Che Hsien. Among these the Hangsan mine is the richest. The Chung Hsin Company in Che Hsien is managed entirely by merchants. Its yearly product is above 300,000 tons and its future is promising as it has an extensive market throughout the lower Yangtze region. Although the Hua Feng Company of Ningyang came into existence later, its yearly output already reaches the total of 600,000 tons. It formerly belonged to Germany, and is now occupied by Japan.

There are great resources along the Kiaochow-Tsinan line. In addition there are coal mines in Fei Hsien, Lin I, Yencheng, Changchue, Ningyang, Hsintai and Laiwu, but in these districts the mines are largely developed by ancient methods, there being no large-scale production.

New Industry in the F.M.S.

China Clay Works in Perak

THERE has been established recently in the Federated Malay States a new industry which is likely to have a far-reaching influence upon the economic life of those states and may have the effect of inducing capitalists to launch other local enterprises of an industrial nature.

The new concern is the Malayan China Clay and Pottery Company, Limited, which has been formed to work the rich clay deposits found in the alluvial tin-mining districts of the State of Perak. The Sultan of Perak is taking a keen interest in the developments.

The initial work was begun 12 months ago, and the Malay workers have proved such apt pupils that the company is already turning out porcelain of a high standard of quality. Both the casting and the "jolleying" methods are employed, and it is said that by the latter method a native operator with a little experience could turn out 2,000 latex cups (used for collecting rubber) in a working day of eight hours. With an installation of 12 machines, it is expected that the works will manufacture latex cups at the rate of over 30,000 per day, and it should be possible to place these latex cups on the market at a price against which the imported article could not compete.

Before manufacturing, the company gave a valuable prize for the best design for a latex cup, and this prize was won by a local planter.

The works are established at Gopeng, in the centre of the tin-mining district. Apart from the manufacture of articles locally, the company is supplying china clay to two of the largest groups of cotton mills in Bombay and to paper mills in Calcutta. It is understood that people connected with the English china clay industry have offered to buy the whole of the Gopeng output, and that the clay has been proved definitely to be equal in quality to the best English china clay. When the labor is more skilled, the company intends to make porcelain in bulk.

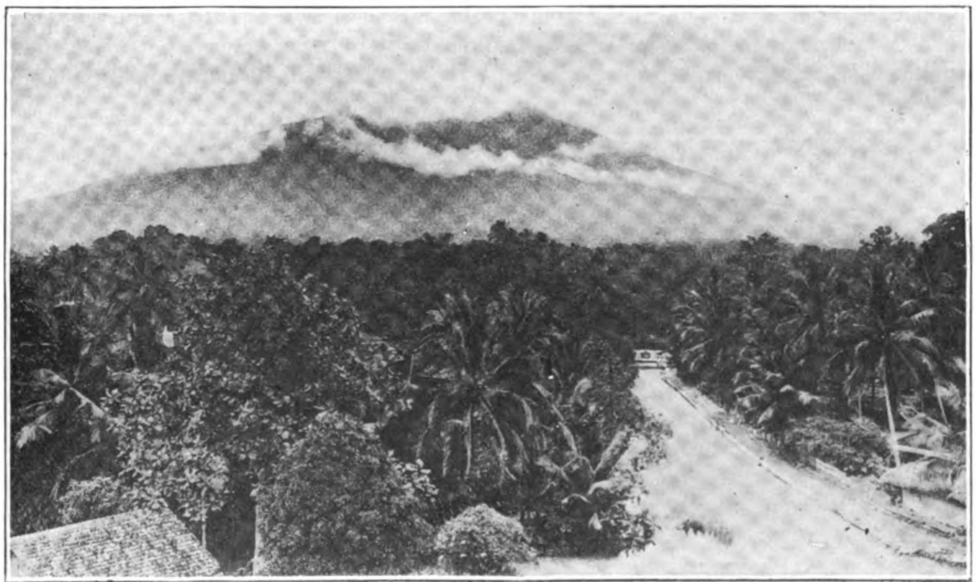
Dutch East Indies Development

THE big public works program for 1922 which has been undertaken by the Netherlands East Indies government, will give some idea of how the Dutch are using the recent loan floated in the United States and England. The largest item in the budget, as will be seen from the following, is for harbors, mines and transportation.

PUBLIC WORKS EXPENDITURES

	Dutch Florins.
Building and workshops required for the postal telegraphic and telephone service	1,406,500
Buildings and works necessary for the maintenance of the salt monopoly	135,800
Buildings and works necessary for the government printing department	441,350
Buildings and other works required by the marine department	1,317,750
Buildings and workshops necessary for the aeronautics (advancement)	1,410,000
Bridges and constructional works for the maintenance of canals, rivers, dykes	9,343,000
Irrigation, drainage, dams, and pier works	14,424,000
Work in the interest of public health	4,015,500
Harbor of Tandjoeng Priok (Batavia)	9,697,125
Harbor of Soerabaja (Java)	15,466,503
Harbor of Makasser (Celebes)	816,492
Harbor of Belawan (East Coast of Sumatra)	5,747,430
Harbor of Emmahaven (West Coast of Sumatra)	904,261
Harbor of Semarang (Java)	2,306,805
Harbor of Tjilatjap (Java)	861,730
Small harbors	3,302,324
Other expenses indirectly connected with the harbor service	1,437,000
Dredging service	5,075,075
Expenditure in connection with the development of hydraulic and electric power	7,670,825
Exploiting of government mines	39,266,044
Preliminary steps connected with the possibility of exploiting iron ores in Celebes	Not yet decided
Post, telegraph, and telephone service	22,989,060
State railways and tramways, also automobile services	93,010,020

Even so large a program, however, can only be appreciated by those who have some knowledge of the extent and potentialities of this group of markets. Java alone has a native population of 36 millions, who are every day, as the development of their country advances, becoming better buyers of manufactured goods in great variety, particularly textiles, hardware and footwear; while the planters and industrialists are growing users of agricultural and other machinery, motor vehicles and chemicals.



The Beautiful Roads of Java: View of Mt. Salak near Buitenzorg

Of the 3,323,000 acres under rubber cultivation in the world as many as 885,000 acres, or nearly one-fourth, are in the Dutch East Indies; palm oil is produced there to nearly 100,000 tons annually, against 125,000 in West Africa, and is of purer quality as a result of better processes; 90 p.c. of the world's supply of quinine comes from Java. Java tea takes precedence in quality over all other varieties; the same island can produce four tons of sugar per acre against only one ton in India. More than half the total of Singapore tin is drawn from the Dutch East Indies; amazingly rich deposits of nearly pure copper have been recently discovered in Timor, iron and coal quite near the surface in Celebes, and diamonds in Borneo; gold is being mined in Sumatra; and enormous forests of teak exist in the last island, and are only awaiting exploitation.

Borneo, as yet practically undeveloped, is, excluding the continent of Australia, the largest island in the world, and Sumatra, practically undeveloped also, is destined to prove one of the richest. Java is at present the only island of this group where the vast agricultural and mineral wealth is being exploited to any degree, and when Sumatra, in the future, is developed to an equal extent, her importance as a world supplier will be colossal.

Rubber—now rising once more in value—tea, sugar, coffee, quinine, copra, palm-oil, tobacco, pepper, and nutmeg, to mention only a few of the many agricultural products, are nearly all found in such quantity that the presence of a single commodity would ensure the importance of the islands. And in addition to these there are the wealthy tin mines of Banka and Billiton, the recently-discovered copper mines in Timor, and petroleum wells, gold, diamond, coal, and iron mines scattered broadcast.

It is to these islands that India must look for a great deal of the raw material she will require as her needs increase and as the output of her industries grows greater. The Djambi oil-fields, from which are obtained annually over 17,000,000 barrels of petroleum, are the nearest source of supply for her motor industry, and, to-day, Dutch East Indian spirit is to be found in the tanks of motor-cars throughout the empire.

Java practically controls the world's quinine supply, and enormous quantities of this drug pass from the Dutch East Indies to Calcutta and other ports.

A considerable bulk of what is known as "Singapore tin" comes in reality from the mines of Banka and Billiton, and Java ranks chief among the exporters of sugar to India. During September, 1,081,478 cwts. of the best grade alone—"Java 23"—found their way into Indian warehouses.

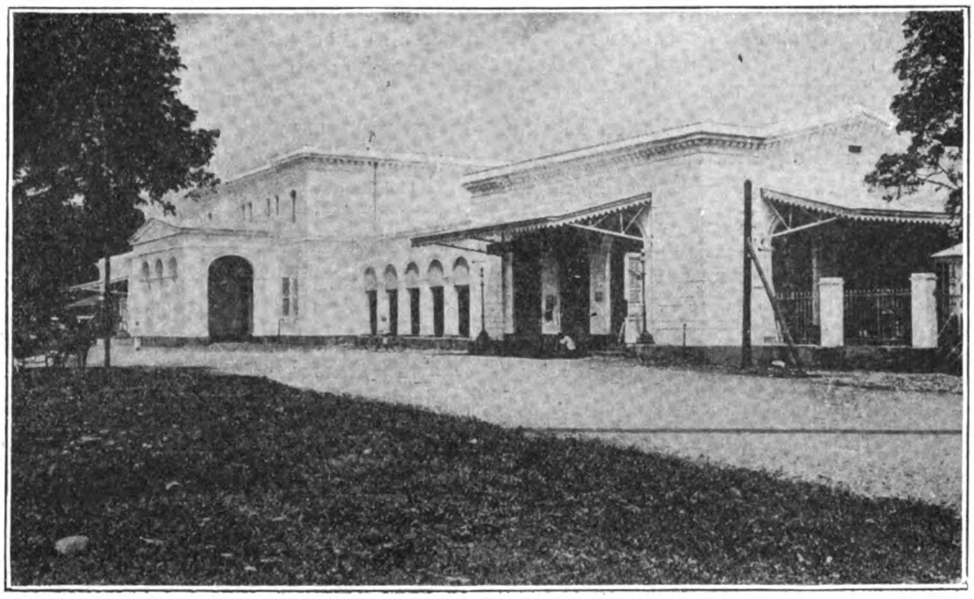
One of the newer plantation industries—so far as the Netherlands East Indies are concerned—is the cultivation of the oil-palm, and it is not beyond possibility that this branch of agriculture will prove the source of great additional wealth.

It is only a comparatively short time since the first oil-palms were brought into the islands, but in Sumatra, especially, the industry is developing at such a

tremendous rate that the position West Africa now holds in this respect is being seriously menaced.

According to a conservative estimate in a very few years 100,000 acres will be covered with oil-palms in Sumatra alone, and the exports from that island will be something like 100,000 tons annually.

Copra production is, of course, an older industry, and, at present, a more important one. Throughout the world there is a serious shortage of edible fats for both human and animal consumption, and exports of this produce will have to increase to an enormous extent before any difficulty will be experienced in finding a market. India, alone, is a copra buyer of enormous potentiality, and her proximity to the Dutch East Indies will undoubtedly react favorably on the market. If Sumatra had been developed a little earlier, perhaps vegetable and not animal fat would have been used to smear the cartridges used by the Indian soldiers in 1857, and it would have needed another pretext to plunge the country into war.



Railway Station at Buitenzorg

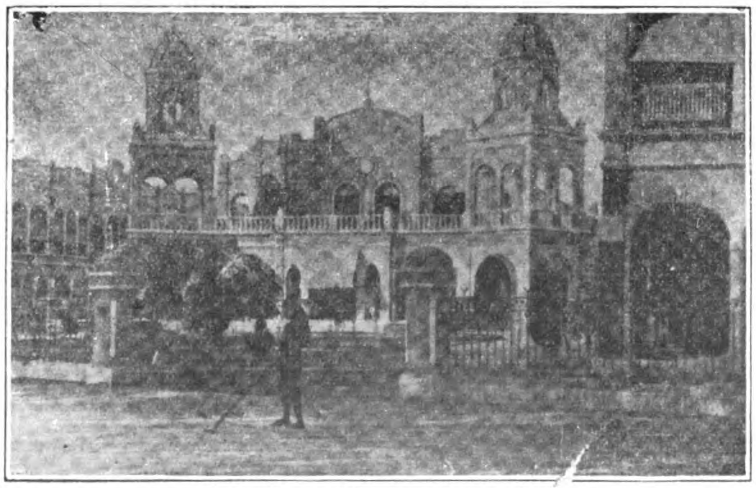
Copra, one of the main constituents of margarine and of the other fatty compounds used in the preparation of food, is the fruit of the wonderful *klapper*, or coco-nut palm, which can be used in such a multitude of ways. No part of the tree is thrown away. Fruit that falls to the ground before it is ripe is made by the natives into medicines. Ripe nuts are eaten both raw and cooked. The hard shell is made into spoons, mugs, and plates; and from the fibrous covering we obtain what is known as "coir," which is made into string, matting, brushes, etc. Even the leaves of the palm can be used to thatch the native huts; and when the tree is tapped, alcohol can be distilled from the latex. Copra is made from the kernel, and its importance has increased tremendously since the discovery of the "deodorizing" process. It is very largely used in the manufacture of cattle-foods, such as oil-cake, as well as in the manufacture of margarine, etc.

Agriculture is the principal but, nevertheless, only one occupation in the Netherlands East Indies. Factories are hard at work turning out all kinds of goods, and ships are being built in at least two of the seven well-equipped shipyards to be found in the islands. Ropes, bricks, chocolate, jam, are all manufactured to some extent; but the whole of this production is swallowed up by the home demand, and still the islands offer—indeed invite—tremendous opportunities for trade.

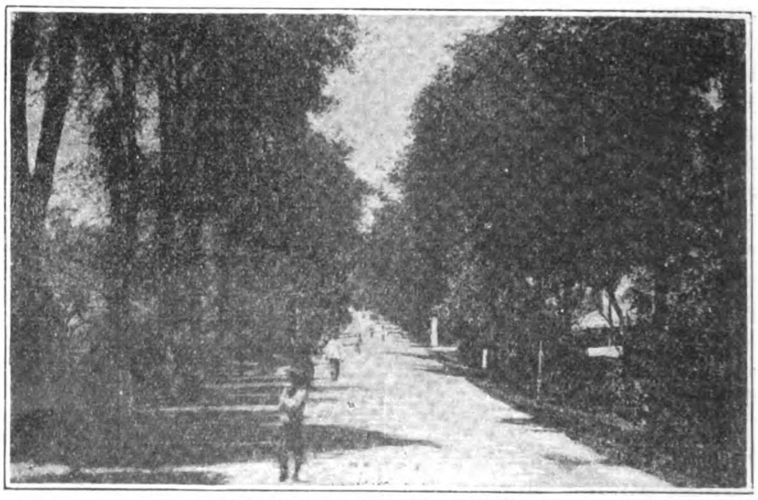
A great opportunity exists in providing machinery and other plant required for full industrial exploitation. For example, there are now 14 large factories in Java alone producing copra, and a further seven in the other islands. Old factories are being enlarged and re-equipped, and new ones built. In 1920, 400,000,000 kilogs. of crude oil were produced. So excellent is the organization of the sugar industry that the sugar committee of India have recently expressed the opinion that the adoption of Javanese methods is essential to progress in the Indian sugar industry. There is undoubtedly an excellent opening at the present time for makers of machinery for sugar mills to do a large trade with the Dutch East Indies, and the same is true of rice-milling plant, in Java alone there being upwards of 50 rice mills. As a sugar producer Java ranges next after Cuba and British India, the island's production coming little short of two million tons annually. In addition to the plantation products already mentioned Java produces in abundance coffee, cocoa, tobacco, coconuts, fibres of various kinds, and many spices.

Comprehensive Irrigation Schemes

Increasing attention is being directed to irrigation, and it is to the credit of the Dutch Government that it has always promoted enterprise in this direction. But the primitive irrigation of the past is now being superseded by more comprehensive schemes, which are being actively pushed forward not only in Java and Madura, but wherever possible in Sumatra, Celebes, and in the southern and eastern districts of Borneo. In the five years from 1914 to 1918 over 33 million guilders were spent on irrigation works in Java and Madura, and 3,500,000 in the outlying islands. But this is regarded as only a beginning, and in all the islands the authorities are showing increasing activity in this matter, with the prospect that in the near future the agricultural possibilities of the Dutch East Indies will be enormously enhanced. In the meantime, the



The Oranje Hotel at Soerabaia



The Kampong Kodo, Menado

work is involving considerable engineering activity and the placing of important contracts.

The Growing Demand for Factory Equipment

Manufacturing industries in this market are still in their infancy, but, the tendency in this direction is significant, and the opening for industrial plant are steadily increasing. Already the manufacture of bricks and tiles, soap, card-board, tinware, paint, brooms, sugar, molasses, beer, leather, rope, casava flour, macaroni, and various chemicals has been undertaken, and even a glass factory is under consideration. Machinery, tools, and implements were before the war supplied almost wholly by Germany, who held the market by keeping local stocks of replacements and repairs. But the demand for these appliances is now much larger, and so far Germany has not been able to makė any considerable post-war impression on the market. In regard to carpenters' tools, the trade is chiefly in cheap hammers, a popular type having the steel handle extending through the eye and locking on the upper side of the head.

An Especially Big Market for Motor Vehicles

Communications in Java are good, but in the outlying islands they are still inadequate. Java is well supplied with railways and a good net-work of well-kept roads upon which run motor vehicles in increasingly important numbers. There are over 20,000 motor cars in Java alone, most of them of American make. From January to April of the present year 2,642 cars were imported, of which as many as 1,711 came from the U.S.A. The climate is especially destructive in regard to tyres, for which the demand is therefore proportionately large. The types of commercial lorries mostly in use on the estates are varied, the vehicles being mainly of two to three tons capacity, and equipped with tipping devices.

The Dutch East Indies are a particularly big market for cotton goods, importing no less than 42,631,000 kilogs of cotton cloths in 1920, in addition to 167,000 kilogs of woolens, 67,000 of half-woolens, 140,000 of silk, and 20,000 of half-silk goods. This was practically double the amount for 1919. British cotton goods are preferred, and in 1920 Great Britain supplied 14,098,000 kilogs, against 10,282 by Holland. Japan two years ago was the biggest source for imports of alum, copper sulphate, and sulphuric acid, and one of the biggest in calcium carbide and sodium carbonate. The contributions of Japan in all these lines is this year *nil*, while Germany's is steadily increasing.

The Need for Local Selling Agencies

Sufficient will have been gathered from the foregoing to indicate that the Dutch East Indies are worth a great deal more commercial attention than is at present paid to them. As a purchaser of all descriptions of merchandise they are already taking a high place, but their prospective value is infinitely greater. The present business is transacted chiefly through a few big firms established at the principal ports of Java, and is exceptionally safe in character; but, whether for good or evil, there is no denying the fact that tendencies are becoming apparent which have for their object a widening of commercial activities and a breaking away to some extent from the influence of the old-established importing concerns, who are sometimes accused of obstructing the introduction of new lines. The only practical way to attempt to gain an entry to the market is by establishing local agencies. That might not be possible in all cases, but groups of manufacturers might combine successfully. The big estates especially are excellent buyers, and are keen for anything which is suitable for their requirements and up-to-date.

Huge Trade Openings in Prospect

To open an office in the Netherlands East Indies it is necessary to register with the authorities in Batavia, but otherwise there are no restrictions under Dutch law. It is, however, essential that representatives of business houses should establish their credit with Dutch organizations, and they should have the highest credentials, carrying as many influential introductions as possible, while a full knowledge of the standing of their principals should be lodged with the leading banks. Here, then, is a market with an industrious population of upwards of 40 millions, with a particularly astute and progressive body of planters and industrialists, a government keen to promote development in every possible way—for the Dutch are specially successful in colonial administration and enormous natural resources that are steadily being opened up. No greater inducements could be offered for the application of persistent commercial enterprise.

Powerful Reclamation Dredger for Bombay

MESSRS. Wm. Simons & Co., Ltd., Renfrew, has launched a large cutter suction pump reclamation dredger which they have constructed for the high commissioner for India for work at Bombay in connection with the Back Bay reclamation scheme which is being carried out under the direction of Sir George Buchanan, K.C.I.E., etc., of Messrs. C. S. Meik & Buchanan.

The dredger which is named the *Sir George Lloyd* after the governor, is fitted with a powerful pumping plant designed to dredge 2,000 yards of clay per hour from depths up to 70-ft. and discharge same through a floating pipe line fitted with ball and socket joints to a distance of 5,000-ft. from dredger. On certain sections of the work for which this dredger has been designed, the distance of discharge required is 10,000-ft. and to permit of this distance being obtained, the builders have on hand a floating pumping station arranged for coupling to the floating pipe line, and fitted with plant capable of discharging to a distance of 5,000-ft. and to a height of 16-ft. above water level.

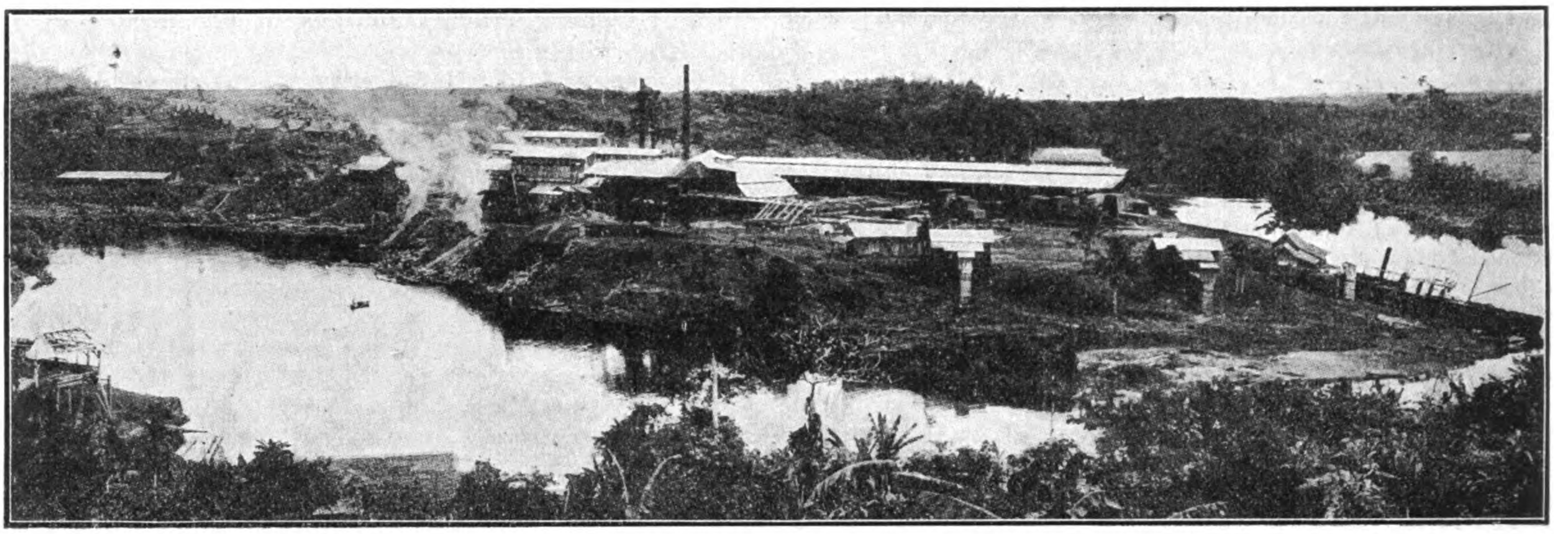
The dredger has been constructed under the supervision of Messrs. Sir J. H. Biles & Co., Glasgow and London, naval architects to the Indian government.

It is arranged that the vessel will proceed to Bombay under her own steam and for this purpose two sets of compound surface condensing engines are provided, capable of giving the dredger a speed of 8 knots.

The pumping outfit consists of a very large centrifugal suction and discharging pump directly coupled to a set of triple-expansion surface-condensing engines. A spiral rotary cutter is fitted on lower end of the suction frame driven by steel spur gearing by a set of compound-surface condensing engines. The suction frame is controlled by independent steam hoisting gear.

Steam is supplied by four large cylindrical multitubular boilers constructed to Lloyd's requirements for 180-lb. working pressure and fitted with Wallsend-Howden forced draught and oil fuel installation.

The control of the dredger is centred on the operating bridge, so that one man can direct all the operations of the dredger and the pipe line, also the intermediate pumping station, telephone communication being fitted between the vessels.



Mill of Insular Lumber Company on Island of Negros

Export Timbers of the Philippines

THE Philippines possess a much greater supply of wood than will ever be used for local demands. The wood consumers of other countries can, therefore, find here a market that will furnish them a large and varied supply for practically all uses to which wood is put; large, because of the immense amount of certain widely useful species which can be obtained by the millions of board feet; varied, because the woods of few countries of equal size, if indeed any at all, can show a wider range of color, grain, hardness, strength and other qualities demanded by special uses. It is no exaggeration to say that some species of wood can be found in the Philippine forests to suit almost any imaginable purpose the user may have in mind.

Export timbers fall roughly into four principal classes; woods for interior finish and furniture, cabinet woods, woods for special uses and heavy construction timbers.

1. *Interior Finish and Furniture Woods.*—The prime requisite of a wood for these purposes is that it be at least fairly abundant. Also, it must be not very difficult to work and to finish, of good size, and last, but not least, of pleasing texture and color. All of these requisites are fulfilled by the woods of the dipterocarp (lauan) family. This family (to which belongs nearly three-fourths of the standing timber of the Islands) occupies the place that the conifers do in the North Temperate Zone, but possesses a wider range of color, hardness and other qualities. The lauan group of the dipterocarps contains the greatest amount of timber specially fitted for interior finish and furniture. Tanguile, red lauan, almon and white lauan are obtainable in great quantities, have a fine ribbon grain when quarter-sawn, and, in texture and color, the first two resemble true mahogany and its substitutes very closely. White lauan differ from them only in color, being white with a very pale grayish-brown tint. It is pretty in natural finish where a light color is desired and, on the other hand, lends itself very well to staining. Almon, a very pale red lauan, is similar to white lauan as regards stains. All of these were little exploited and used during the Spanish *régime*, but the estabishment of the steam logging industry has put on the market an ever-increasing supply, so that now large quantities are used for medium and high-grade interior finish and furniture. These woods are now being used in Europe and America in the manufacture of high-grade furniture for cases of musical instruments, such as piano and phonograph cases, and for other uses where a beautiful figured wood is desired. The wood is also strong and for this reason it is used in the manufacture of aeroplane blades.

The other woods of the same family, guijo and apitong, are also abundant. This fact and their greater hardness enable them to fill a demand for flooring in place of oak, red beech, maple and other American woods which are yearly becoming scarcer. Guijo is light ashy brown to reddish brown and apitong is somewhat darker. Finished with wax or varnish, they range from reddish brown to dark chocolate. Both are hard and of rather fine texture. If a very hard wood is desired for flooring, yakal, the hardest and heaviest of the dipterocarps and the most abundant of the hard, heavy and durable woods in the Philippines, will fine a place.

There are several woods of other families which, though not as abundant as the lauans, are still to be obtained in sufficient quantities to supply industries that do not require many millions of feet per year. Such are lumbayau, pagatpat and nato. Lumbayau is similar to red lauan in appearance, but is slightly harder and tougher and has a more conspicuous flake grain when quarter-sawn; nato is of similar color and texture, but of very homogeneous grain; pagatpat also is very even-grained, but of a rich dark-brown color.

There are also frequently used in the Philippines narra, tindalo, acle, molave, supa, calamansanai, ipil and other hard, durable and beautifully colored woods; for the export trade, however, these woods, on account of their beauty, comparative scarcity and higher price, should be rather classified as cabinet woods.

2. *Cabinet Woods.*—Of these the Philippines possess such an astonishing variety that it is difficult to give any idea of them in a short pamphlet. Foremost among this class on account of their large size, beautiful color and grain and durability are the woods of the narra (or locust) family—acle, banuyo, ipil, narra, supa and tindalo—all of which would delight the eye of every American maker of fancy furtniture and cabinet-work. A dining-room set, a piano, a billiard table, or any similar piece of furniture made of one of these would attract attention at once no matter what comparison it might have to bear with other aristocrats of the lumber world. To attempt an enumeration of different classes of cabinet-work, naming for each one the various Philippine woods available would necessitate much unnecessary repetition. Perhaps the easiest way to give the cabinetworker a notion of what he may demand (and obtain) for his purposes is an enumeration of some of the better-known woods roughly classified by colors: Black-ebony; black, streaked or mettled with red-brown or gray-camagon, ata ata, bolongeta (the Philippine persimmons); dark brown-dungon, ipil, mancono, pagatpat, pahutan; reddish brown- apitong, batete, betis, katmon, guijo, nato; red amugis, bansalagin, ka-

lantas, nato, palo-maria, sibukao, tabigi, tukangkalau; grayish-banawi, makaasim, tabau; yellow-alintatau, bankal, batikulin, malakadios; pale straw color, creamy or nearly white—lanete, miao, white nato, molave. It must not be thought that the foregoing list is complied with a view to color alone, any and every wood, good, bad or indifferent, being dragged in to fill up; on the contrary, those named are all good woods, rarely attacked by boring insects, and not generally subject to discoloration except in the case of such light-colored woods as are easily stained by too slow or otherwise inefficient seasoning. In fact, the list could be doubled by including other woods used, on account of their varied color and grain, for musical instruments, fine cabinetwork, sculpture and carved articles, canes, hilts and sheaths for weapons, inlaid and mosaic work, desk and toilet novelties, picture frames; etc.

3. *Special Uses.*—For bowling balls, bearings, stern shaft bearings, mancono has been used successfully. For the first-named purpose, dungon has also been found good. Bansalagin, alupag, malabayabas and tiga, all of fine texture, difficult to split, and very heavy, are recommended for experiment. For such articles as dumb-bells, paperweights, etc., requiring weight but not necessarily so fine and tough a texture, not only these, but a considerable number of other very hard and heavy woods are available.

For tool handles and other wooden parts of tools, there are generally required woods that are either hard or tough or both.

Typical View of Hardwood Forest

Chisel and hammer handles and mallets especially need to be hard, tough, and difficult to split; for these agoho, betis, calamansanai, dungon, guijo, malugai, palo-maria and yakal can be supplied; all these woods are by far more resistant to white ants and fungi than either hicory or ash. Handles made from the latter woods have to be continually moved in ware-houses of the tropics because white ants and other insects attack them very readily; two of these, guijo and yakal, can be obtained in very large quantities, while the others occur in quantities sufficient to make tool handles, if not by millions, at least by thousands. Most of these, as well as many others equally hard or harder but not so tough, would supply turned and shaped handles such as grips and butt plates for braces and drills, plane and saw handles, plane bodies, scratch gages, scraper and drawknife handles, and hollow-tool handles.

For long agricultural tool handles, in which hardness is less essential than toughness and difficulty of splitting guijo, the hardest grades of lumbayau, malugai, manggachapui and yakal would make excellent substitutes for ash. The same species, with the exception of lumbayau, would make good axe handles.

For wagon tongues and other vehicle stocks, hubs, spokes and felloes, an excellent material is found in guijo; it is not very heavy, but tough, difficult to split, and can be obtained in any size and quantity desired. In tropical countries, guijo withstands the weather better than hicory and would find use in the manufacture of spokes intended for use in the tropics. Malugai, which is a little lighter, but equally tough, is not as abundant as guijo, but can still be supplied in fair quantities.

The Cigar-box lumber par excellence of the world has for many years been the "Spanish cedar" of tropical America; in calantas is found a perfect substitute, so nearly identical in color, texture and odor as to be almost indistinguishable. It is the only native wood used in Manila for high-grade cigar boxes. For cheaper boxes several of the lauans and nato are used.

Shuttles and spindles must be hard, rather tough and resistant to abrasion. For these purposes a considerable supply of the sapwood of the trees of the camagon (persimmon) tribe could be furnished. Calamansanai and malabayabas are also recommended for trial in shuttles.

4. *Heavy Construction Timbers.*—A number of large trees furnish hard, strong and very durable construction timbers. It is scarcely probable that the United States market will seek any considerable quantities of such material, except for very special pieces of work; but three species at least are to be mentioned as furnishing a supply of magnificent posts or beams for all kinds of heavy wooden structures, namely, ipil, guijo and yakal. Allied to heavy construction is the use of timber for railway ties, durability

Philippine Forest Trees—Island of Negros

and strength being the two qualities required. For this last purpose not only the three species above named are available, but at least twenty others are found, which, although they are not large enough or are not found in sufficient number to yield a great supply of large timbers, still can furnish ties for steam or electric railways. This statement refers, of course, to ties used without any preservative treatment. For treated ties, both the number of kinds and the supply available are much greater; practically all the lauans are very abundant and of great size and the majority are suscoptible to impregnation. Their mechanical properties are similar to the yellow pines (long leaf, short leaf and loblolly pines) of the United States. Beside the lauans, there are two harder woods available in great quantities, namely, guijo and Apitong. Apitong properly treated would make very superior ties in the tropics while in the temperate regions, it can be used untreated.

Following are brief descriptions and notes on some of the most important timbers of the Islands:—

Dipterocarp Family

TANGUILE (*Shorea polysperma*).—This is the best of the group so far as concerns grain, figure and hardness, though it has not the rich red color of red lauan.

RED LAUAN (*Shorea negrosensia*).—This, as its scientific name indicates, is most abundant in the island of Negros. It is one of the largest trees in the Islands, reaching sometimes a diameter of 7-ft. or over. Quarter-sawn, the wood has a beautiful ribbon grain which, with its red to dark reddish-brown color, has led to its being exported together with tangile and almon under the trade name of "Philippine mahogany," though it is not at all related to the mahogany family. Red lauan has been used in the last few years in great quantities for interior finish, high-grade furniture, cases of musical and scientific instruments.

TIAONG (*Shorea teysmanniana*).—This is intermediate in color and texture between mayapis and red lauan, being of a very uniform, light, glossy red. It is abundant in south-central Luzon, but very little, if any, comes to the Manila market, as no large operators have located in this region up to the present time.

MAYAPIS (*Shorea squamata*).—This is a very pale red lauan of straight-grained, smooth, glossy texture. It would make a very pretty veneer where a light red color is desired, but could also very readily be stained. It is less abundant than either red lauan or tangile.

WHITE LAUAN (*Pentacmo contorta*).—This is perhaps the most abundant and certainly the most widely distributed species of its family in the archipelago. The wood is whitish with light-gray, yellowish or very pale-brown tints. It is light, rather soft, with a fairly straight but slightly crossed grain, producing a narrow "ribbon" when quarter-sawn.

KALUNTI (*Shorea, Mindaneensis sp.*).—This is even lighter in color than white lauan and possibly a little softer and lighter in weight. It has not heretofore come into the Manila market in any great quantities nor under its own name it is found, as far as known, only in Mindanao and some of the adjacent smalerl islands.

(To be continued)

Douglas Fir Ties in China

ACCORDING to Canadian Trade Commissioner J. W. Ross, Douglas fir and Oregon pine have not yet been thoroughly tested for railroad tie purposes, and he refutes the claims made by Australian and Tasmanian lumber producers that hardwoods are preferable on account of their alleged longer life and resistance to dry rot. He says :

In my opinion Australian and Tasmanian hardwood is not likely to be extensively used for sleepers in railways in North and Central China in the future, any more than in the past, for the reasons which are given below. In the first place, it should be stated that neither Oregon pine nor Douglas fir sleepers have ever been used on Chinese railways to any extent, as the following statistics of imports will show. Accordingly the statement that they have a short life cannot be proved, for the reason that no extensive use of them has ever been made.

The following tables of imports of railway sleepers into China for 1913, 1919 and 1920 will show that neither Australia nor the United States nor Canada furnished any considerable quantity of sleepers to China, but that Japan received nearly the whole of the trade in each of these years :—

1913	Total imports	1,539,836 pieces
	Japan	1,444,540
	United States	14,621
	Australia	None
	Canada	None
1919	Total imports	1,521,706 pieces
	Japan	1,510,519
	United States	None
	Australia	None
	Canada	None
1920	Total imports	1,810,176 pieces
	Japan	1,710,350
	United States	64,946
	Australia	19,457
	Canada	None

The question may be asked, "Why is it that in these—as in all others for the past nine years—Japan has been the only country that has furnished railway sleepers to China in any great quantity ? and the reply is, entirely on account of the cost, Japan being able to supply the needs of China in sleepers at a price lower than they could be imported from any other country. Without doubt hardwood sleepers from any other source would be superior to and more desirable than untreated sleepers from Japan ; and this is why neither Australia nor the United States nor Canada have within recent years received any great share of the demand for sleepers for Chinese railways. The Chinese government railway administration have no great surplus of funds for any purpose, and whenever they are in the market for (say) 500,000 sleepers, they hesitate about paying $2,500,000 or more for the filling of the specification when the same quantity can be purchased for $1,000,000. From working statistics which have been prepared by competent railway engineers, the life of an untreated Douglas fir or Oregon pine sleeper on the railways of North and Central China is from five to seven years, and that of a creosoted pine sleeper from ten to twelve years, and of Jarrah wood from Australia fifteen years or more. A difference of opinion exists among railway officials as to which is the cheaper. A number contend that, although the initial cost is greater, the long service and infrequency of replacement make Jarrah wood, at three times the cost of Douglas fir, just as cheap in the long run. Others maintain that the high initial cost and interest on invested capital more than counterbalance the greater length of life of the sleepers.

Siamese Railways

At the present time the Siamese department of state railways has completed, or has under construction, the following length of line :—

	Completed Kilometres.	Under Constructions Kilometres.
Northern line (including the Korat, Petriu, and Sawankaloke lines—i.e., all the normal gauge lines) ..	950.5	78
Southern line (including branch lines)..	1,301	44
North-Eastern line (Korat to Ubon) ..	—	100
Eastern Extension (from Petriu to Aran Pratet and the Cambodian frontier)	—	99
	2,251.5	321
	(1,407 miles)	(200 miles).

Survey work has been completed on the north-eastern line for a distance of 311 kilometres, and on the eastern extension for a distance of 119 kilometres, says the *L. and C. Express*. Rail-head on the northern line is now at Chiengmai, and on the southern line at the Golok river, the final terminus on the Kalantan border. Plate-laying has not yet commenced on the other two lines. Work is proceeding with the conversion from broad-gauge to metre gauge of the line between Bangkok and Korat. Conversion has already been effected on the line connecting Bangkok with Petriu. The metre gauge will in time be applied to the whole system of the country. Tenders haver ecently been invited by the department for the supply of superstructures for steel bridges and of bogie rail trucks.

Front View of the Mill

The "Great China" Cotton Mill at Shanghai

ANOTHER large cotton mill financed by Chinese capital held its formal opening on April 14 last. This was The " Great China " Mill, considered to be one of the best organized and equipped mills in the country. It was promoted in 1919 by Mr. C. C. Nieh, president of the Chinese chamber of commerce and managing director of the Heng Foong Cotton Manufacturing Company, Ltd., and Mr. E. R. Yin, a Harvard graduate.

The new mill property is situated on the north bank of the Wan Tsao Pang creek, and covers 149,811 *mow* of land. A few hundred yards away are the Whangpoo river and the Wan Tsao Pang railway station, making the location admirable as far as transportation is concerned.

The authorized capital of the company is Taels 2,000,000. Last year, the company purchased 11,000 spindles of American manufacture, with accessories, in addition to the 35,000 spindles of English manufacture already purchased. The present property of the company, including machinery, buildings, power plant, etc., represents an investment of Taels 2,800,000, an average of Taels 600,000 per 10,000 spindles. This cost is considered the cheapest among all of the newly established cotton mills in China.

The organization of the company is simple and efficient. Under the general manager and the assistant general manager are the general office and three departments, spinning, electricity and construction. The general office is subdivided into sections, such as correspondence, business accounting, store, warehouse, etc. Each department is headed with an expert, under whom are clerks and foremen. At the close of every day, reports are made by the clerks and foremen to their respective department heads, who in turn submit reports to the general manager and the assistant general manager. With this detailed information at hand, the managers can tell at a glance the working of the mill, the production, etc., and thus can shape their business policy accordingly.

A separate office is established in Shanghai, which buys cotton, sells yarn, and also keeps the important books of the company.

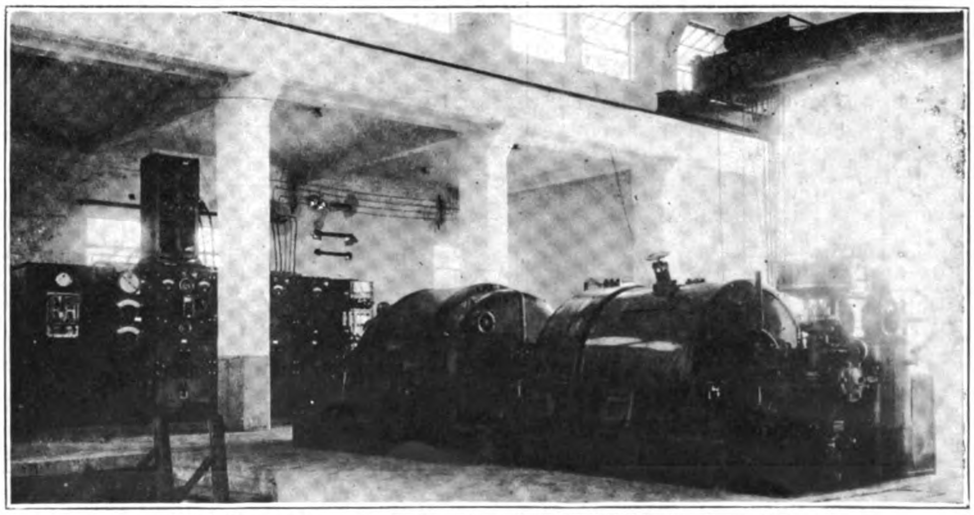
The mill produces yarns of 10 counts to 40 counts. With the most up-to-date machinery and modern appliances, operated by experienced hands, the result is a product excellent both in quality and appearance. This can well be testified by the fact that the yarn is welcomed by consumers and is enjoying a high market price.

The main mill, godown and power plant are tow-storied buildings of modern design in reinforced concrete, fire-proof construction. The main mill is 120-ft. wide and 700-ft. long and is well lighted with steel sash. The shop and office buildings are of modern design, built of brick and wood. The dormitory and lodging houses are Chinese style, built of brick and wood. The kitchen and dining room are Chinese style, built of bamboo and plaster. Special attention has also been paid to building roads, drive-ways, fences, drainage, etc., thereby enhancing the value and appearance of the mill.

The mill is equipped with 45,000 spindles spinning machinery, 11,000 of American manufacture, Saco Lowell make, and 35,000 of English design made by Messrs. Brooks, Doxey & Co. The machinery is run by electricity generated by two 1,000 K.W. turbo alternators, one of German make (Gorlitzer Maschinenbau) and one from the English Electric Company. The power plant consists of four Babcock and Wilcox boilers.

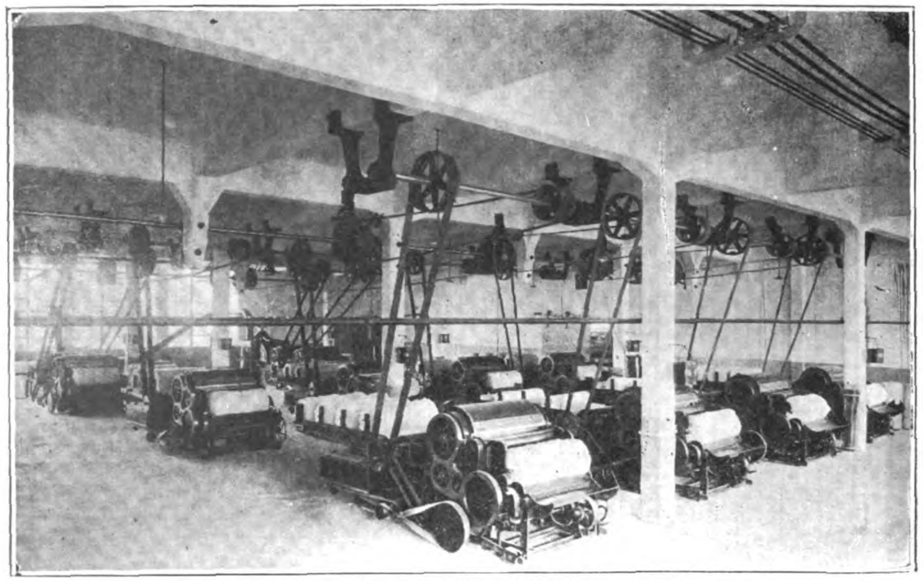
The mill employs about 2,000 laborers. Three-fourths of them are women workers. An employees' club was organized for the welfare of employees. A special reading room has been assigned to the club, in which are placed periodicals, commercial and industrial journals and all kinds of newspapers. Football teams, basketball teams, tennis teams, boxing teams, etc., have been organized. A weekly meeting is held at which employees are present and during which moving pictures and lectures are given.

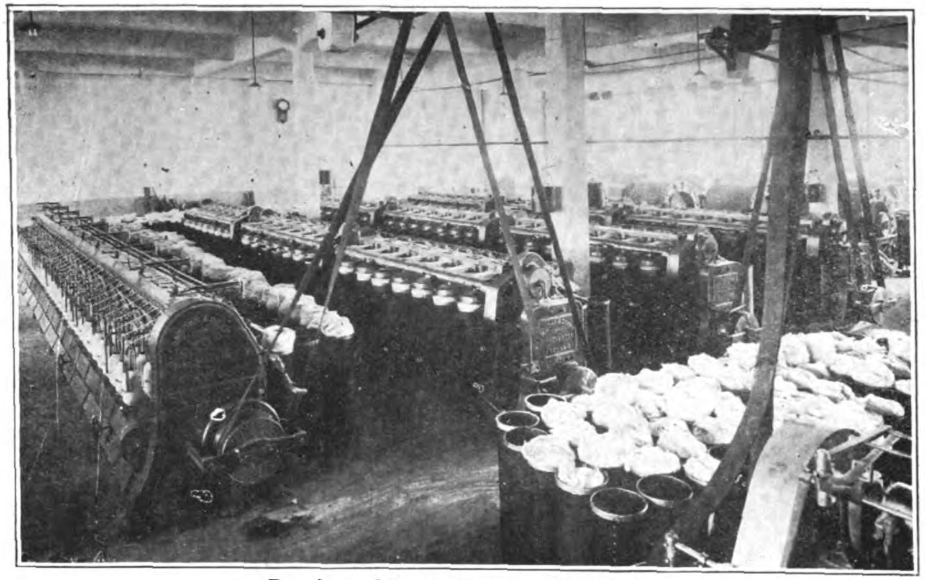
The company's trade-mark is the map of the republic of China.

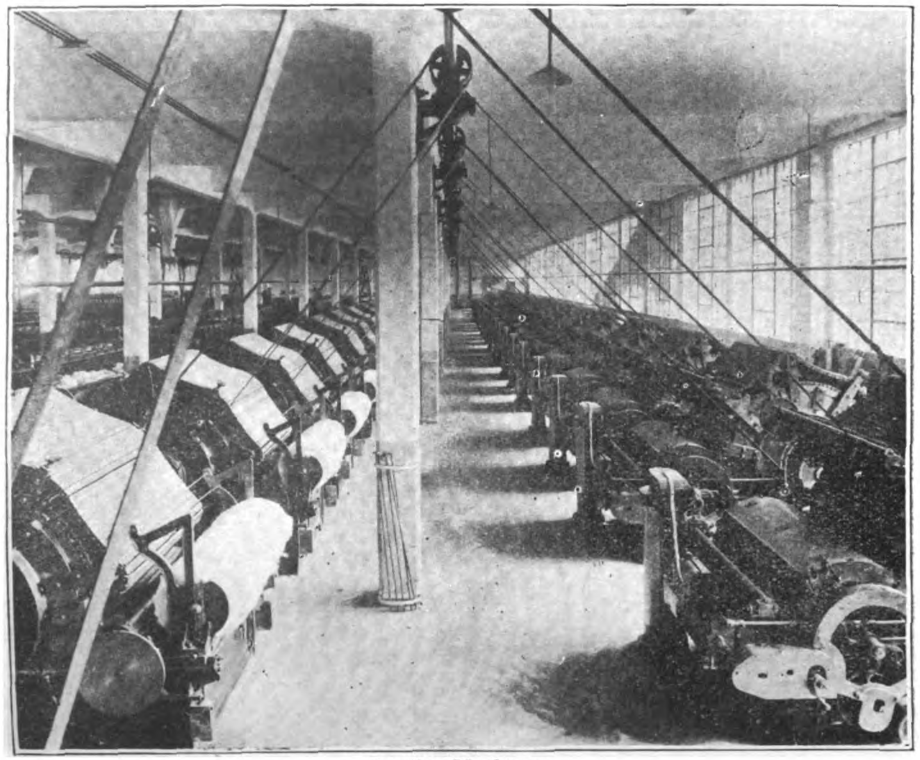


Dick-Kerr (English Electric Co.) 5,000 K.W. Turbo-Generator

THE "GREAT CHINA" COTTON MILL


Scotching Machines


Brooks and Doxey Drawing Machines


Carding Machines

Reeling

Swiss Water Turbines in Asia

I. Japan

THE tremendous strides made by Japan during the last fifty years are a matter of common knowledge. Towards the end of last century, the need for power made itself felt, and the utilization of water power first thought of. The electrification of the railways is making great strides, and this explains the rapid construction of water power plants, especially in the vicinity of the great centres.

The projection and building of the plants has remained in the hands of Japanese firms, while it was found necessary to apply to foreign firms for the mechanical parts, as the home manufacture could not supply the rapidly increasing needs of the country.

Of European firms, that of Escher Wyss & Co., Zurich, has supplied by far the greatest number of water turbines, viz., 260 turbines for 500,000 h.p., since 1900 to the end of September, 1920, and a further 40 turbines for about 125,000 h.p. are in course of execution. The total deliveries, therefore, comprise 300 turbines with about 625,000 h.p. output.

Japan called for large untis from the very beginning; turbines of less than 1,000 h.p. are rare. The average output of the turbines sent by Escher Wyss & Co. to Japan during the last twenty years amounts to close on 2,100 h.p., that of the turbines ordered in 1920, as much as 3,600 h.p.; among these there are units of 17,000 h.p.

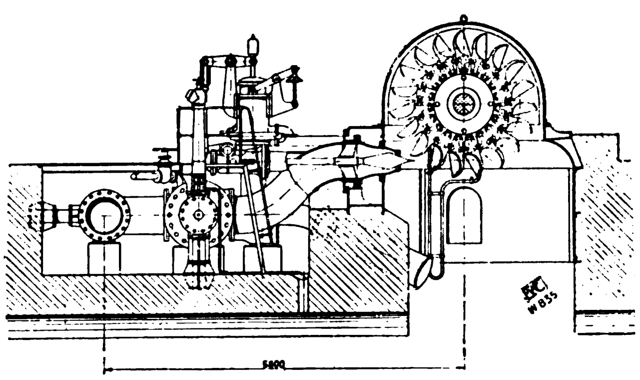
The configuration of Japan is exceedingly favorable for all sorts of waterfalls, and it may be said that up to now only falls of medium height have been utilized. There are practically no low-pressure plants, and high-pressure plants work with a maximum of falls of 300 to 400 metres: in other countries falls of 1,000 and more metres are utilized. Hence it is easy to understand that Francis spiral turbines are mostly used and that important power stations are equipped with these. We mention a few of these stations here. The greatest need for electric energy for lighting and power is at the capital, Tokyo. Several companies have undertaken to supply this power, so that in the last twelve years various large power stations have been built. Of these special mention may be made of the Tokyo Electric Light Co., the Katsuragawa Electric Power Co. and the Kinugawa Electric Power Co.

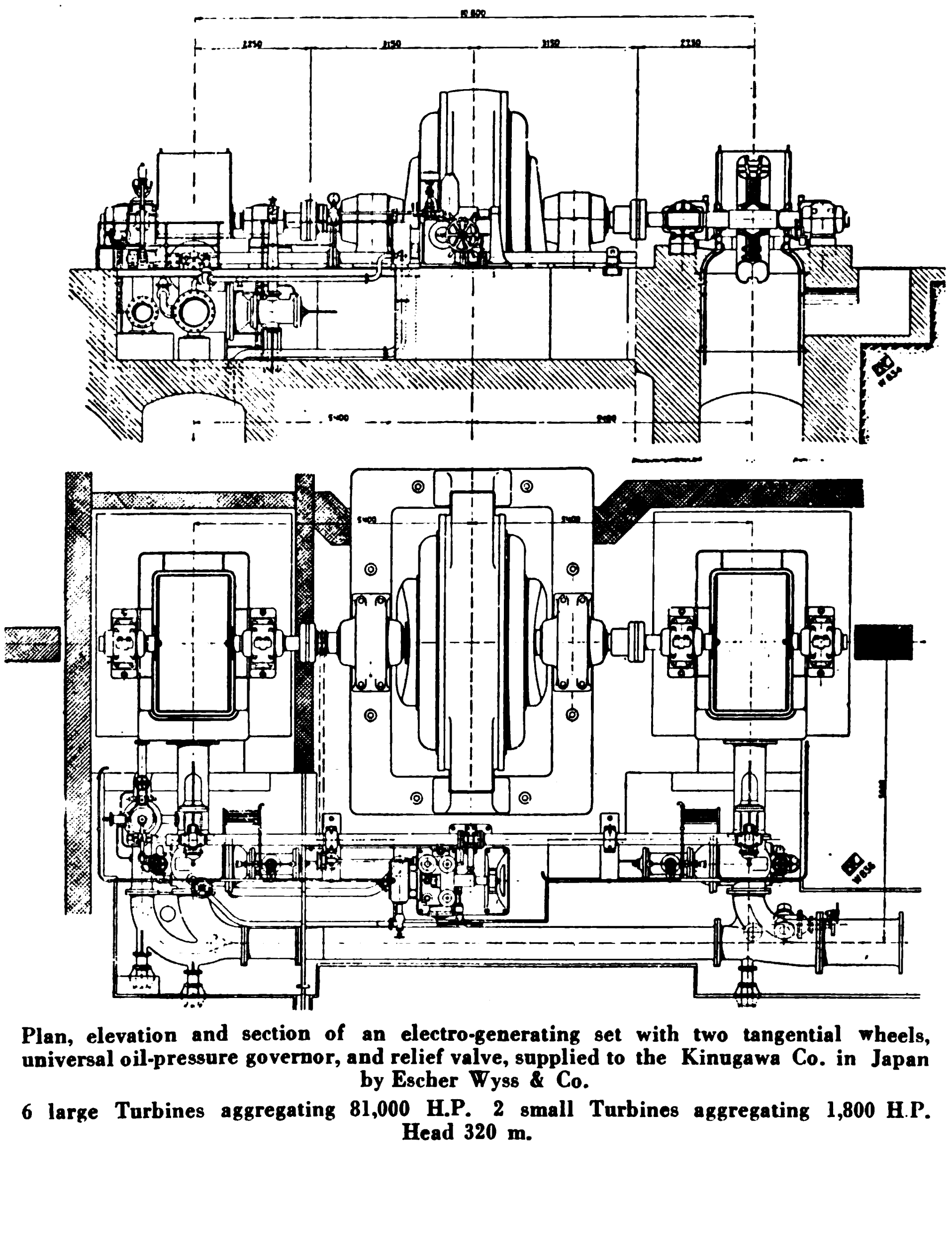
The first company opened a station of 27,000 h.p. on the river Katsura, 170 kilometres from Tokyo, in 1908. Fig. 2 gives a sectional view of the plant with the various pressure pipings leading to the turbines. The plant consists of two buildings, the machine hall and the transformer house built at right angles to the upper face wall of the machine house.

The station is equipped with six twin-spiral turbines, five of which work under a fall of 95.5 m., with an output of 4,500 h.p. each, while the sixth (which was supplied later) is calculated for 4,950 h.p. These turbines are coupled direct to the generator and make 500 revolutions per minute. The division into six groups with a comparatively small output was caused by the difficult transport conditions.

The second station built by the same company on the same river in the years 1910 to 1912, already exhibits larger units of a maximum output of 12,500 h.p. In normal work, five turbines together supply 50,000 h.p., the sixth turbine being kept in reserve. The net head fluctuates between 112 and 120.5 m. Large twin-spiral turbines were likewise chosen for this station so as to avoid too large dimensions on the one hand, and, on the other, to obtain a higher number of revolutions by employing two runners. Fig. 1 shows the plan, elevation and section of the turbines installed in this plant.

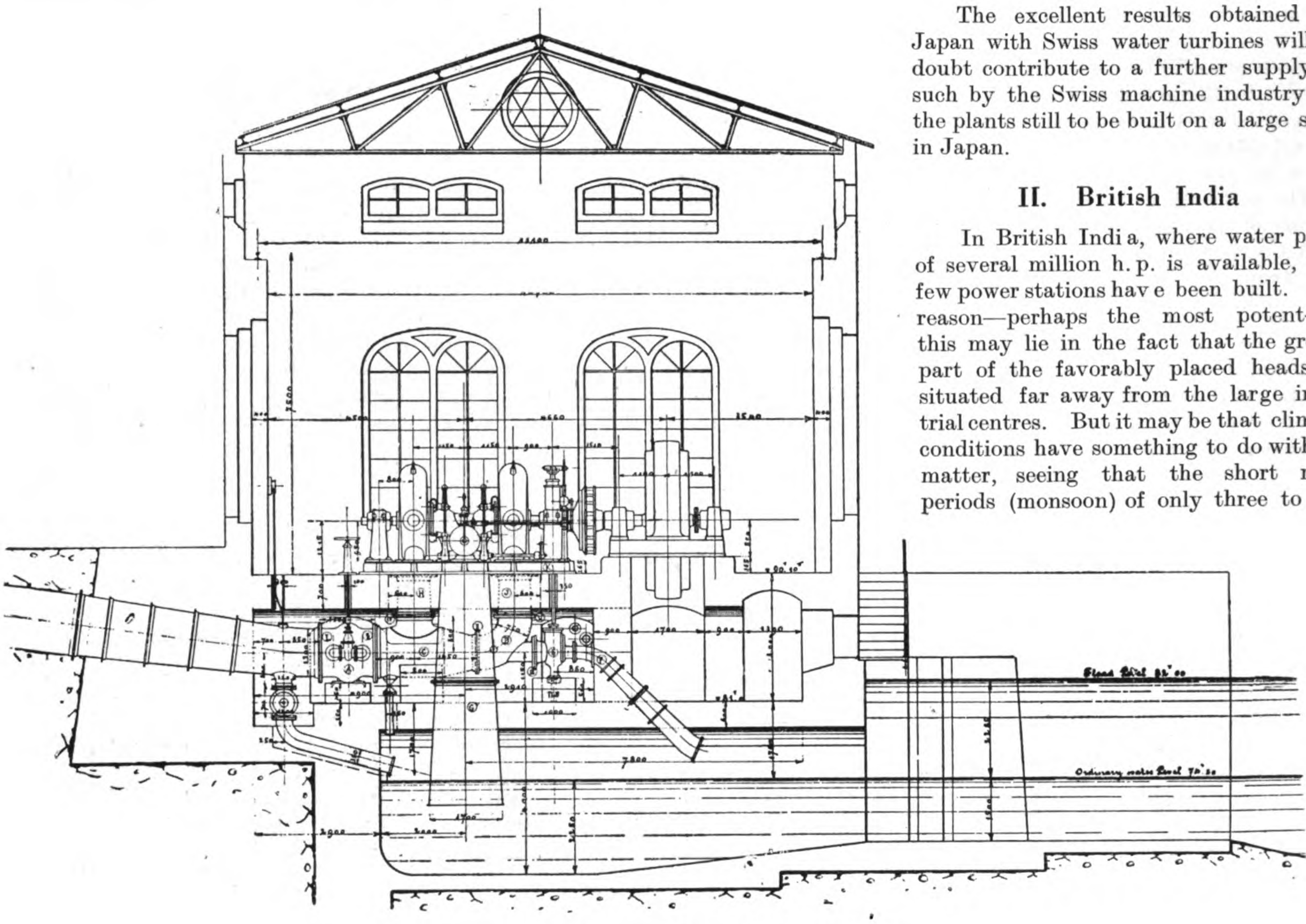
The general arrangement of the engine house is seen by Fig. 1, together with the pressure conduit of about 215 metres length, the diameter of which is 1,860 mm. in the upper





Plan, elevation and section of an electro-generating set with two tangential wheels, universal oil-pressure governor, and relief valve, supplied to the Kinugawa Co. in Japan by Escher Wyss & Co.

6 large Turbines aggregating 81,000 H.P. 2 small Turbines aggregating 1,800 H.P. Head 320 m.



The excellent results obtained by Japan with Swiss water turbines will no doubt contribute to a further supply of such by the Swiss machine industry for the plants still to be built on a large scale in Japan.

II. British India

In British India, where water power of several million h.p. is available, very few power stations have been built. One reason—perhaps the most potent—for this may lie in the fact that the greater part of the favorably placed heads are situated far away from the large industrial centres. But it may be that climatic conditions have something to do with the matter, seeing that the short rainy periods (monsoon) of only three to four months annually, make the construction of huge reservoirs an imperative necessity if a constant supply of water for feeding the power stations is to be secured the whole year round.

Sectional view of the Kinugawa Hydro-Electric Power House

zone and diminishes to 1,650 mm. in the lower. The whole turbine house had to be built underground in order to gain head by the construction of a long tail race. The transformer house, however, was built on the surface.

The Katsuragawa Electric Power Co. have two stations, the second of which is fitted up with turbines supplied by Escher Wyss & Co. in 1919. The station contains four groups of 9,200 h.p. each for a head of 114 to 117 m.

A considerable difference from the other power stations mentioned, lies in the vertical arrangement of the shafts, a state of things occasioned by the extremely intense fluctuations of the level of the tail race, so that it was found desirable to place the generator above the highest level, an operation which was only possible by using vertical shafts.

The same arrangement was made for the three turbines lately ordered for the plant of the Ujigawa Hydro-Electric Co., which supplies the town of Osaka with electricity. With a head of 45 m. each unit is to produce an output of 17,000 h.p. These will be the largest turbines in Japan.

To return to the Tokyo power stations. The plant of the Kinugawa Electric Power Co. is the only large high-pressure station in Japan. It was built in the years 1911 to 1912. The head of 320 metres is one of the highest in the country used for this purpose. Six generators of 12,500 h.p. each are coupled directly on both sides with tangential wheels. Another high-pressure power station may be mentioned in connection with the above, viz., that carried out on a southern island by the town of Kumamoto. The head here is 240 m. and the water is conveyed in pipes of 850 m. length to the four tangential wheels of 2,700 h.p.

Finally, we may mention the central at Kidzugawa, which has two groups of 2,700 h.p. each for a head of 22.25 m.

In this respect, the Tata Hydro-Electric Power Supply Co., Ltd., Bombay, have set an excellent example by constructing a great number of reservoirs by means of which they intend to obtain a very high degree of power. For the time being the power station near Khopoli, which commenced operations about five to six years ago, is supplying power to Bombay at an approximate distance of 70 kilometres. A second plant is in building.

Both the turbines and the conduits for the first plant at Khopoli were supplied by Escher Wyss & Co., Zurich.

The building of dams made it possible to bank up the water into three large lakes, the combined volume of which is 280 million cubic metres. The water is conveyed to the water chamber by an open canal of 7 kilometres' length. The water transverse section of this canal has been so calculated that the maximum of water flowing through is sufficient to obtain an output of 120,000 h.p.

For the time being, a pressure conduit of 2.5 kilometres' length, with diameters of 2,100 to 1,800 mm., leads from the water chamber to the distributing pipe, where the branching-off takes place in four further pipes of 1.4 km. length each and a diameter of 1,070 to 960 mm., each of which feeds a turbine of 13,500 h.p. The net head is 505 metres, which means that only tangential wheels are used. Owing to the height of the head and the large output, these wheels must be made entirely of cast steel. The water jets necessary for supplying the power are amongst the largest ever used till now, being 190 mm. in diameter.

The turbines are coupled direct to generators with 300 revolutions a minute, producing an alternating current of 5,000 volts ; this is stepped up to 100,000 volts and conveyed in conduits of 70

km. length to Bombay, where the power is chiefly used for spinning mills.

Among other Indian plants are the power station at Cauvery Falls, built by the government of Mysore. Since 1900, 14 tangential wheels have been fitted up there, the output of which varies between 1,250 and 2,700 h.p. with a head of 120 m. The turbine supplied last year by Escher Wyss & Co., Zurich, will develop 5,600 h.p. This is a Francis turbine, as, of recent times the use of these for heads of over 100 metres is nothing extraordinary. Escher Wyss & Co. have further supplied a number of smaller turbines to British India.

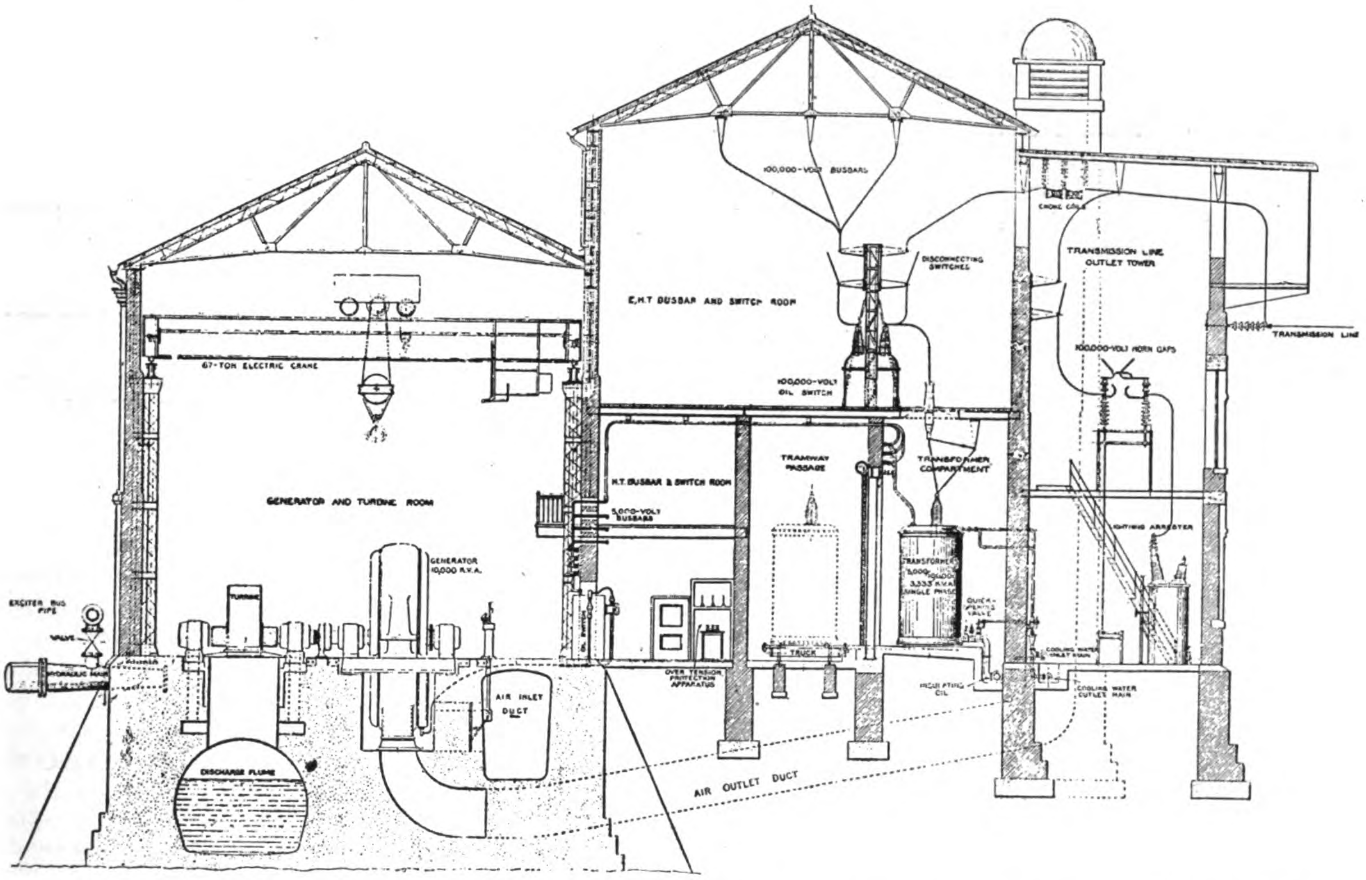
III. Dutch East Indies

In the Dutch Indies, especially in Java, there were about 30 plants fitted with turbines up to 1,500 h.p. The government is now building two power stations, viz., Tjisaroewa and Tjikapoendoeng, for which Escher Wyss & Co. are supplying five turbines of 1,500 h.p. each, with 750 revolutions per minute, three for a head of 86 m. and two for one of 104 m.

IV. New Zealand

Another land in the South Seas which has given the above firm big orders is New Zealand. Side by side with a large number of small stations, we may mention the power station at Lake Coleridge which has a head of 140 m. and which, when first built in 1912, had three units of 2,750 h.p. each with 500 revolutions. A further and similar group was supplied in 1915, but owing to the lack of power which manifested itself already in 1916, it was determined to build in a larger unit of 5,750 h.p. to which a further group of the same size will shortly be added.

These short notes will have sufficed to show the importance of the supply of water turbines for the big power stations of the Far East, and at the same time indicate the efficiency of Swiss manufacturers.



Sectional Elevation of the Khopoli Power House of the Tata Hydro-Electric Supply Company supplying light and power to Bombay. Equipped with eight sets of Escher Wyss hydraulic impulse turbines of the horizontal type (13,500 B.H.P. each) direct coupled to Siemens Brothers 3-phase generators

Railway Electrification in Japan

PLANS to electrify the Tokyo-Yokosuka and the Tokyo-Odawara lines are now ready to be carried out, having been signed by the minister of railways. According to a detailed account of the scheme, the new undertaking is to be fully completed by the end of the year. The cost of this project is estimated at Y.14,378,000, which the government railways of Japan is now authorized to defray out of its repairs and improvement credits.

Trains of eight cars each on the present tracks between Tokyo and Yokosuka and Tokyo and Odawara will be in operation when the lines are completed. On the Tokyo-Kozu line express or direct passenger trains are to be run with electric locomotives. The freight trains are also to be run with electric locomotives. On shunting tracks and in repair shops steam locomotives are to be used.

Electric power for this equipment will be 1,500 volts, but on the urban section the voltage is to be limited to 1,200 volts. Direct current transformer stations are to be erected near Yokohama, Ofuna and Ninomiya, the old stations to be used in supplying power to the section between Tokyo and Yokohama. The power required is to be supplied by the government plant that is soon to be completed at Akabane. Tokyo Electric Light Company is to be drawn upon in emergencies.

Eight electric locomotives have been ordered from British and American locomotive works. Thirty more engines, 60 electric cars and 90 trailers are to be built within the next two years. New sheds will be built near Kamata and Takashima-cho stations.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

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SHANGHAI, JUNE, 1922.

John Foord

WITH the death of John Foord, Americans in the Far East have lost the pioneer who was first to recognize, in 1898, the effect of European policies upon future American trade in China, and who brought together the leading American merchants into an association to protect national interests in Eastern Asia and bring influence to bear upon the government to take necessary action to assure that the door to equal opportunity would remain open. John Foord was the founder of the American Asiatic Association, the parent body of all subsequent American organizations for the promotion of American trade and ideals in Asia. He brought into his new work the ripe experience of a life-time of journalistic effort, a brilliant fighting record against shams and corruption of all kinds. The city of New York was a cleaner and better place to live and do business in after John Foord's memorable exposure of the Tweed ring in the columns of the *New York Times*. This stands as one of the highest examples of fearless journalism in bringing to justice the most notorious gang of political crooks that ever defied public opinion. It placed John Foord in the front ranks of political writers, a position he continued to hold until his death. As secretary of the American Asiatic Association he took the lead in all legislative and other activities for the promotion of American interests in Asia. As editor of *Asia*, the American magazine on the Orient, founded by the late Willard Straight, he has contributed to a more profound and accurate knowledge of the complex problems of this continent, at all times living up to the highest traditions and ethics of journalism.

John Foord died in New York on April 17 as the result of injuries received when he was struck by an automobile. He had reached the ripe age of 78, and was still in harness, young in spite of his years. He had well earned his rest many years ago, but continued to work and contribute his efforts to bring about an amicable solution of problems that he well realized might otherwise lead to hostilities. To those of us of a past generation who have worked with him and shared his fights for a square deal to all Asiatic peoples and promote harmony and better relations between America, Japan and China, his loss is well nigh irreparable. Americans in Asia have lost a faithful friend, stalwart champion. There are few indeed with the ripe knowledge of Far Eastern affairs to take his place in the council chambers of the various organizations that exist for the promotion of American interests and ideals in Asia.

The *New York Times* pays him the following eloquent and fitting tribute :—

John Foord devoted a long life-time to journalism. In the beginning his field was the general news of the day. Later he turned to editing, still in the daily field, and finally his interests and his labors concentrated on the Far East, so that he will be most immediately remembered as editor of *Asia*, as one of the founders of India House and as the organizer of the American Asiatic Association.

But very many years before he had brought his gifts of clear-sightedness, a sense of fair play and an ability for forcible expression to bear for the good of Japanese and Chinese, he was devoting them to municipal affairs, then of transcendental concern to New York.

Born in Perthshire, Scotland, on October 12, 1844, he was educated in Dundee and spent his young manhood in the service of newspapers in London. The opportunities of a new world appealed to him, however, and in 1869 he became a reporter on *The New York Times*. He hardly was launched on his new career when *The Times* began its historic and in the end successful fight to break the Tweed ring. To his pen fell the task of analyzing the evidences of fraud in the books of controller connolly. The fight against tweed, inevitably, was not won at once, but to Foord's masterly handling of that opening assault always has been attributed a large share in the eventual success of the battle.

The Tweed exposures were Foord's greatest news job. Soon after he turned to writing editorials, displaying a wide grasp of affairs and proving particularly able in what he had to say on financial and commercial topics.

In 1876 Mr. Foord became editor-in-chief of *The Times*, then still a republican newspaper. He held that position until 1883 with unwavering adherence to the interests of the public and an unselfish and kindly modesty that leave him affectionately remembered by those of his associates who remain.

From *The Times* he went to The Brooklyn Union, of which he became editor and part owner. Next he edited *Harper's Weekly*. For the last twenty years he was a member of the editorial staff of *The Journal of Commerce*, devoting himself to economics and international topics. His editorials on Far Eastern subjects were stamped particularly as authoritative because of his sympathetic interest in those lands, his travel and his broad reading. In the summer and fall of 1920, while in the Orient, he returned once more to the columns of this newspaper, contributing a series of signed articles on his observations.

As a pioneer among broad-spirited Americans in the last generation Foord worked for fair and liberal dealing with the peoples of China and Japan. The growth of his interest in the Orient led him naturally to the formation in 1898 of the American Asiatic Association.

It was at this time that German and Russian aggression upon Asia was threatening Chinese and American rights therein. The association was formed as a protest against this encroachment. Under Mr. Foord's secretaryship the association since then has steadily made its infuence felt for the liberalization of all our treaties and economic relations with the Far East.

Mr. Foord was the founder and editor of the Journal of the American Asiatic Association, published from 1898 until 1917. In that year the late Willard Straight, who was president of the American Asiatic Association, agreed to finance the development of the journal into a broad general popular magazine, and he and John Foord united in organizing *Asia*, with Foord as editor.

In 1914, Mr. Foord joined with James A. Farrell, president of the United States Steel Corporation, the late Willard Straight and Robert H. Patchin in organizing the National Foreign Trade Council, and a little while later Mr. Foord was one of those associated with Willard Straight in the founding of India House. His speech responding to the toast "Why India House ? " at the first dinner of the club lives as a classic in the minds of its members, and has been carried all over the world by American traders, bankers and diplomats.

Mr. Foord was a thorough American also, of broad public spirit. He was very proud of his Scotch ancestry, of Scotch achievement, throughout the world. He was for many years president of the Burns Society, and invariably responded to the toast "The Immortal Memory" at the annual dinner. He wrote the foreword in the recent book "Scotland's Mark," published as a record of Scotch influence in America in connection with the celebration a while ago of "America's Making." Mr. Foord wrote the life of Andrew H. Green, one of the factors in city government in cleaning up the Tweed ring ; the life of Simon Stern, eminent lawyer and at one time president of the Bar Association ; *The New York Times Jubilee Supplement*, which chronicled the history of fifty years of this newspaper.

* * *

Japan and the Gentleman's Agreement

By Warren Ryder

THERE is a saying that if one tells a story often enough it will be accepted finally as true even by the teller no matter how little foundation in fact actually it may have. Generally speaking this saying is correct, and proof of its correctness, if otherwise lacking, may be found in the belief that has grown up concerning Japan and the gentleman's agreement. So often and so widely has Japan been accused of the violation of the terms of this agreement that the general public almost without exception has come thoroughly to believe the accusation without, of course, having recourse to any inquiry, investigation or statistical data that would tend to establish the facts.

Another factor in creating belief in this accusation has been the general public's almost complete lack of understanding of the terms and intent of the gentleman's agreement, which it has ignorantly regarded as some sort of an exclusion plan contemplating the preclusion of all Japanese immigration to America. Holding such an opinion, while observing the constant coming of Japanese to America, the public has been lead inevitably to the conclusion that Japan has not kept her promise, that she has been guilty of bad faith.

It seems well, therefore, and desirable to investigate in order to ascertain and announce the facts, but first of all to set forth as clearly as possible the terms of this much mentioned and abused

agreement, as well as a brief statement of the circumstances that lead to its adoption.

The gentleman's agreement, as it commonly has come to be called, resulted indirectly from an anti-Japanese agitation in California, and to some extent in other sections of the Pacific coast, which demanded a cessation of the immigration of Japanese laborers to America. It is not in any legal sense a formal treaty or agreement, and the term applies merely to the substance of a number of informal notes, exchanged in 1907 between secretary of state, Root, and Ambassador Takahira, of Japan, discussing the subject of the regulation and control of Japanese immigration to America, and culminating in an understanding by the terms of which Japan pledged herself upon her honor as a nation to limit the issuance of passports to such of her subjects seeking to go to continental United States as fell within the following designated classes, namely :—

(1) Non-laborers ;
(2) Former residents ;
(3) Parents, wives or children of residents and
(4) Settled agriculturists.

The first class embraced only non-laborers, such as merchants, diplomats, professional men, financiers, students, travellers; and so forth, who, as before, were permitted to come and go at will. The second class embraced any Japanese, non-laborer or laborer, who sought to come to continental United States to resume a formerly acquired domicile ; in other words, any Japanese who had already become a resident of America but who had returned, or in the future might return, to Japan for a visit. The third class comprised exactly what it states, namely, the parents, wives or children of residents, firmly granting the right, therefore, of a Japanese resident of America to send to Japan for his wife, parents or children. The fourth class related to such Japanese as had already invested in farms or other agricultural enterprises in this country and who, desiring to assume active charge of such farms or enterprises, were granted the right of entry into America and have come to be referred to as "settled agriculturists." Also, Japan, of her own accord, agreed to deny passports to Japanese laborers desiring to enter territory contiguous to continental United States, such as Mexico and Canada.

From this it will be seen that while the gentleman's agreement did rigorously restrict, it did not contemplate or seek to secure the total preclusion of Japanese immigration to America and, therefore, did not amount to an exclusion act ; nor has it ever been so regarded by those informed upon the subject.

Thus having established the history, the terms and the intent of the agreement, the next step is to ascertain if—as so frequently charged—it has been violated by Japan. Regard for the facts compels the emphatic declaration that it HAS NOT, for, despite all the assertions of the anti-Japanese propagandists, I am unable to find in any of the reports of the United States commissioner general of immigration a single case wherein Japan has been shown to be guilty of any violation, but do find, upon the contrary, in these reports and in statements emanating from other official sources that she has kept the terms of the agreement. The 1919 report of the United States commissioner general of immigration makes the following statement :—"It will be remembered that the passport agreement, which was made in 1907, provides, in effect, that Japan will not issue passports good for continental United States to laborers, unless such laborers are coming to resume a formerly acquired domicile, to join a parent, husband or children, or to assume active control of an already possessed interest in a farming enterprise in America. While the agreement relates only to immigration to continental United States, Japan soon voluntarily extended the same provisions to the movement to Hawaii, so that in effect all immigration of Japanese laborers is subject to its terms. Non-laborers, of course, are not affected and are free to come and go under the same conditions which obtain in the case of aliens of other nationalities." Also, we find the acting secretary of state, Mr. William Phillips, saying in a letter to Hon. James D. Phelan, under date of August 28, 1919, that :

"Adverting to your letter of July 24, relative to the so-called 'gentleman's agreement' between this government and the government of Japan for regulating the immigration of Japanese to the United States, I have the honor to say that, after giving due consideration to certain facts and figures recently obtained from the honorable the secretary of labor, I have confirmed the opinion which I have held for some time on this subject; that is, that the present arrangement is working with a fair degree of satisfaction, with the possible exception of the immigration of so-called Japanese 'picture brides' to the United States." And in concluding the letter, Mr. Phillips says: "The number of Japanese wives coming to the United States is undoubtedly increasing but the authorities who have in charge the administration of the immigration laws have not found that the Japanese government is violating the agreement." Thus we find officials whose duty it is to know, and who have every means of knowing, stating in substance that Japan has kept the terms of the gentleman's agreement. Furthermore, the congressional committee on immigration and naturalization has just concluded a series of hearings in California and, Washington in which every phase of the Japanese situation was fully investigated and, during these hearings at which the most prominent anti-Japanese workers appeared and testified under oath, not a particle of proof, or a scintilla of such evidence as would be accepted in a court of justice, did I hear or find to show that Japan in any instance had violated the terms of this agreement. What must be the significance of this failure to furnish proof ? What must it mean ? It must signify and it must mean, it seems to me, that no proof of Japan's violation of the gentleman's agreement was furnished BECAUSE NO SUCH PROOF EXISTED ; BECAUSE NO SUCH VIOLATIONS HAD TAKEN PLACE. And it would seem to mean, also, that another of the grave charges made against the government of Japan had been predicated not upon fact but rather upon ignorance and misunderstanding.

The problem arising out of the Japanese question is a serious one. A satisfactory solution of it is greatly to be desired. But no solution satisfactory or lasting can result from an agitation that finds its chief inspiration, I believe, in race prejudice and intolerance or from a consideration that is not preceded by and based upon the fullest and fairest investigation. There has been altogether too much of a tendency upon the part of those opposing the Japanese to exercise snap judgment in the matter, to make statements without thorough investigation. Some individual, sincerely interested and no doubt desirous of giving aid to the settlement of the problem, spends three or four weeks in Japan and returns to assert a deep and fundamental understanding of the whole Japanese question, and to warn that there is grave danger of the Japanese presently overrunning the whole of America. Some other individual proceeds leisurely down through California to the Mexican border and then announces, without submitting anything by way of definite proof, that thousands of Japanese are being smuggled into California with the connivance of the Japanese government, and that if California and America are to remain white the Japanese must go. And then other individuals, whose sincerity in the premises I am not here questioning, take alarm and map out a campaign to secure legislation to exclude further Japanese from America, and to deny the fruits of their toil to those already here and the right of citizenship to their American-born children. It seems most unfortunate that this kind of activity should characterize California's contribution to the solution of the Japanese problem.

* * *

The Chinese Eastern Railway

By Shao Ying T. C. Yeh

(Out of the mass of publicity matter circulated in the United States by the Chinese delegation during the Washington conference, the following presentation of China's side of the case in the matter of control over the Chinese Eastern Railway is of special interest and value).

THE construction of this railway was undertaken in pursuance to the agreement reached between the government of China and the Russo-Chinese Bank in 1896. Under the provisions

stipulated therein, it was agreed that "China and Russia establish a company to be called the Chinese Eastern Railway Company to construct and manage this railway." "The shares may be bought only by Chinese and Russians. In the imperial sanction given to the Chinese envoy empowering him to negotiate the matter, the company was accorded concessions, privileges and facilities, in return for which the company was to pay to the Chinese Government five million treasury taels on the day the line is completed and traffic commenced." The line was to remain the property of the company for eighty years from commencement of traffic, at the end of which it would revert to the Chinese government without payment. China is given, however, an option to take it over at the end of thirty-six years on payment of all capital, debts and interest owed by the company and undistributed profits, if any.

During the disturbances of 1918, allied forces were sent to Siberia to maintain order and assist in the evacuation of the Czecho-Slovaks there. To facilitate the evacuation, and inter-allied commission was created to take over the administration of the line. This arrangement provided for a technical board and a military transport board comprising of a representative from every nation that had a force there,—including one from the Russian government, which issued a declaration in approval of the arrangement—Both in this declaration and in the one issued by the allied representatives, emphasis was laid on the fact that, in doing so, it only intended to facilitate and improve the railway, and no violation of Russian sovereignty was contemplated. Although stipulation was made for the dissolution of this body upon the withdrawal of the allied forces, the railway is still under its management to-day.

A careful study of the relation between the company and the Russian imperial government clearly shows the political rôle of this railway with the inevitable disadvantageous results to its commercial standing. The losses were at first made good by the funds of the Russian government, but when the Bolshevik *coup d'etat* did away with the board of directors of the company at Petrograd, it was deprived of the only financial prop on which the company has been relying. The result was disastrous. This was further aggravated, first by the political interest of some of the directors such as General Horvath and Vice-Admiral Kolbchak, then by the enormous depreciation of the rouble and lastly, but not the least, by the struggle of the various political factions in Eastern Siberia and the consequent disorder along the line, a natural result of guerrilla warfare.

Such strifes were not only detrimental to the Russians themselves but were gradually affecting the safety of the Chinese. China suffered under this state of affairs as long as it was compatible with her own duty towards her subjects. The time came at last when any further inaction on her part would endanger her own security, and after consulting her allies she joined them in sending an expeditionary force into Siberia to assist in maintaining some sort of order there.

When the inter-allied commission came into existence, China opposed the inclusion of the Chinese Eastern Railway under its administration. The protest, however, failed to have any effect.

The reasons on which China based her claims for the sole administration of this railway can be summarized as follows :

(1) The line is on Chinese territory. The lands through which the line runs and the adjacent land are grants to the Chinese Eastern Railway Company by the Chinese government, free of charge. It is, therefore, only just that its administration by any other party besides Russia, to whom China is bound by treaty, can only be interpreted by China as derogatory to her territorial integrity.

(2) China is one of the two principal shareholders. By virtue of the agreement of 1896, "Russians and Chinese only can be shareholders." As a matter of fact, the Russo-Asiatic Bank remains the sole shareholder of this company with the exception of very few individual shares. But this bank is a joint Chinese and Russian concern, the former having subscribed and paid up the sum of Tls. 5,000,000.

(3) China is a creditor of the company. According to the agreement of 1896 the company was to pay to the Chinese government the sum of Tls. 5,000,000 in return for the land granted to the company by the Chinese government. This, for some reason or other was never carried out, and together with interest it now amounts to something like Tls. 11,000,000.

(4) By the agreement of October 2, 1920, signed between the Russo-Asiatic Bank and the ministry of communications, it was stipulated that, pending an agreement between the Chinese government and the future Russian government recognized by China, China will assume the control over its administration in order to give it efficient protection. China therefore, is in honor bound to make good the promise she has given to the bank.

(5) Since the Chinese assumed control of the railway its financial conditions have been greatly improved. Instead of relying upon Russian government subsidies to make up its enormous deficit as had been hitherto the case, the revenues and expenditures are now almost balanced.

In claiming administration over this railway, China is not only actuated by her own interests but also by consideration for the welfare of the company. This can be easily proved by a careful study of the agreement of 1920, a provisional understanding pending the constitution of a recognized Russian government. It contains no special derogations of the statutes of the railway company as of the 1896 contract, which were confirmed. To guard against possible abuse it contained a special clause confining the activities of this line to those of a purely commercial character. All these facts demonstrate clearly that, beyond protecting her own and the company's interests, China has no intention to take advantage of the present Russian situation, although it would be quite justifiable, seeing that the Tls. 5,000,000 to be paid by the company stipulated in the original agreement was never paid up.

As soon as a stable government is established in Russia that can take over the rôle now forced on China, negotiations for a settlement will no doubt be arranged at the first favorable opportunity. The matter in short, is one between China and Russia and to be settled between these two countries when China can find a recognized government to deal with in Russia. That this is clearly acknowledged by Russia herself can be seen from the aforesaid agreement.

It may be added here that the inter-allied commission was called into existence by reason of military exigencies. Now that all the allies except Japan have seen fit to withdraw their forces, it has outlived its usefulness. Why not dissolve it and prove to the Russians as well as the Chinese the good faith of the allies as stated in their declaration in 1918 ? To the Russians, this will mean the fulfilment of a promise eagerly awaited ; to the Chinese, its termination will mean the ending of what has always been considered a gross violation of their administrative integrity and territorial sovereignty.

In view of the above considerations, China is prepared to bear on her own shoulders the whole burden and responsibility of continuing to maintain the efficient administration of the railway as long as Russia is not in a position to do her share. Any interference on the part of others will be, therefore, not only unjustifiable, but detrimental to its continual smooth working. We have not the slightest doubt that such a course of action will be met with the disapproval, not only of the Chinese, but also of the Russians, whose interests China is bound by treaty to uphold and protect.

SHAO YING T. C. YEH.

* * *

The latest financial report of the Chinese Eastern Railway under the presidency of Dr. C. C. Wang, indicates that the financial stringency of the line has been much eased owing to payments made by the various powers for services rendered during the war and post-war period. In effect, the railway showed a net profit

of more than $2,000,000 for 1921 after paying for many improvements. According to the latest reports, the amounts owed by the powers to the railway are as follows:

Country	*Original amount owed*	*Outstanding*
Japan..	$6,544,249	$247,874
Great Britain	358,016	48,565
U. S. A.	659,310	91,451
(American merchants)	469,376	469,376
France	452,690	452,690
China	182,177	182,177
Italy ..	56,759	10,115
Czecho-Slovakia	3,477,650	3,477,650
Others	273,334	273,334
Total	$ 12,473,561	$5,253,232

* * *

The Value of an Ounce of Gold?

IN 1913, Dr. Sun Yat-sen damaged his political career in China by advocating a currency scheme guaranteed by merchandise and the products of the country stored in government warehouses. Overnight, he fell from the pinnacle of fame into a padded cell. Ten years later, the total gold reserves of the world are computed at $5,000,000,000, of which, sixty per cent. is in possession of the United States with the inter-allied nations in her debt to the tune of $19,000,000,000. With the gold mines of the world closed down because it is now unprofitable to work them, and with only about a dozen mines with ore reserves ahead of them for twenty years, with the United States draining the world of its gold in payment of debts, the question must arise of how these debts are to be paid. Obviously, if they cannot be paid in gold, if paid at all, they must be paid in commodities, which in turn must have a fixed value.

Now comes Thomas A. Edison and asks the simple question: "what in your opinion would be the approximate market value of a troy ounce of pure gold if all the governments of the world should demonitize it?"

What is the answer? What regulates the price of gold? The current belief is that gold is subject to the law of supply and demand the same as other commodities, or that an ounce of gold is worth a certain price because it costs just so much to produce it. The price of pure gold is $20.67 per troy ounce, simply because the nations of the world have fixed that price as standard. Nothing more, nothing less. Gold in itself is the most worthless of all metals, its value being limited almost entirely to monetary and ornamental purposes. In 1492, the year America was discovered, the total stock of gold in Europe, in plate, jewelry and coin was estimated at about $600,000,000. Since the discovery of America, about 18 billions of the yellow metal have been added to the reserves of the leading nations of the world. Of this amount fully one half was plundered from the nations of the new world in the fifteenth and sixteenth century. Of the total amount, less than one half exists to-day. Every ounce of gold in the world has cost a human life. During the last ten years, the annual gold production of the United States has been reduced fully fifty per cent. What has an ounce of gold cost? More than it is worth in dollars, besides untold cost in human blood and tears.

If Europe is steadily drained of its gold reserves, with no money acceptable to the United States except at ruinous rates of exchange to pay for the things bought from us, with no credit for the supplies and materials she needs, unable to pay what she owes, in many cases not even the interest due, how can America sell her surplus and Europe buy from America. America has too much gold and Europe has not enough. Yet America demands more and more gold in payment for her commodities, and Europe is unable to buy, with the consequence that we are passing through a business depression as acute as that which exists in Germany. America is suffering more than Europe is. The whole world is thereby financially disarranged.

If is is impossible to settle the debts of the world with gold, why should not money or credits be based on "capital goods," land, industries, mines, as well as gold reserves? Why should not the bonds or guarantees of a nation be as good as the nation itself, that the "will to pay" as well as the ability to produce goods of value, be acceptable as gold in settling these debts?

The United States has sixty per cent. of the gold reserves of the world but is suffering from an acute stagnation of business. If large gold reserves mean prosperity then not a man should be idle in the United States. Germany, with depleted gold reserves and billions of paper money has less idleness than the United States. If mere volume of money means prosperity, then Russia should be enjoying the "golden age." How can the nations of Europe reduce their paper issues without demoralizing their industries and how much gold would be required to stabilize Europe's paper issues, and, what is more important, where is all this gold to come from, when it is all flowing one way?

There may be a solution to this world problem along lines that will maintain the gold standard, but we fail to see how it is to be brought about unless the United States is willing to accept cancellation of some of the war loans or some rearrangement that will shift the load from Britain and France on to her own shoulders. We are approaching the time when the ideas of Dr. Sun Yat-sen may have to be seriously considered as the only way to bring about world stability, in which commodities, merchandise, natural products, necessities of life, etc., will serve as a basis of values. For if Europe is to pay at all she must pay in trade. If this is so, America and the neutral nations of the world must suffer through business depressions.

* * *

International Good Manners

"IT is our duty to so direct the foreign relations of our country that the power of public opinion shall be for peace. More quarrels have come from insults than from injuries," declared Eliju Root in his San Francisco address. *The New York Times* editorially takes up the advice of this sane old American statesmen, and says that "behind and superior to formal diplomacy and official negotiation between governments, the condition precedent of a successful working of the best-devised machinery for composing international controversies and averting war is the will, the steady purpose, of each people to maintain peace, so far as possible. As Mr. Root said in his San Francisco address: 'It is our duty so to direct the foreign relations of our country that the power of public opinion shall be for peace.'

"The old dynastic, intriguing, conscienceless diplomacy is gone for the most part. The more "open" form that succeeds it may be made less powerful for good by the violence of public men and newspapers that roar and rage for their own purposes against some foreign nation or nations. So far as these continuous discharges of suspicion, hostility and falsehood have their effect, they beget or increase at home a misinformed and embittered feeling which is responded to abroad by a quickened and growing and dangerous resentment.

"In the close intercommunication and interpenetration of modern states, a wealth of disputes, misunderstandings, claims and counter-claims is inevitable. They can be settled amicably in the spirit of conciliation, compromise, friendly give-and-take. Representatives of the nation can get together "to talk things over," as Mr. Root says. "If there is a controversy, the most important thing is to get some one to change his mind." Meanwhile, all the purple-necked orators and organists of ill-will have been doing their best in both countries to create an inflamed state of the public mind. They are a minority, but in each country the influence of the rancorous faction in the other is apt to be overestimated.

" More quarrels," continues Mr. Root, " have come from insults than from injuries. If democracy is to conduct foreign affairs without taking the nation into strife, it must not give cause for resentment in the minds of other peoples." That is, democracy must improve its international manners. Ambassadors treat one another as gentlemen. The sovereigns they represent, the sovereign peoples, must do the same. Good temper, moderation, avoidance of heated and insulting language should prevail. The United States, in particular, should act in accordance with its power, dignity and responsibility.

" It should be understood," Mr. Root frankly declares, "that the American people will taboo loose and unfriendly talk about the people of other nations, and such punishment "—the withholding of votes from disturbers of peace—" will be the first step in our conduct of foreign affairs." The taboo can't be imposed too soon ; and it is refreshing to hear Mr. Root making this needed plain talk in the hunting grounds of Chief Hiram."

* * *

Political Agitation Affects Trade

THE aftermath of the Japanese boycott agitation in China and the campaign against the Anglo-Japanese alliance, in which British traders were also menaced by a boycott if the alliance was extended, is being revealed as the statements of conservative British business men are made public. The movement started in China was carried to India ; the club which whacked the Japanese was held over the British in the same identical manner, and with equal injury to legitimate trade. In destroying Japan's trade in China, British subjects who worked in close co-operation with other foreign leaders in inciting the Chinese to a boycott, failed to grasp the fact that two can always play at the same game. Japan paid the price of this campaign, and can now sympathize with the British.

The conditions in India arising from this boycott are summed up by Sir Montagu Cornish Turner, the chairman of the Chartered Bank of India, Australia and China in his speech at the last meeting of the shareholders held in London on April 5th. After setting forth the satisfactory balance sheet figures, which permitted the payments of a dividend of 14 per cent., together with a bonus of 6s. 3d. per share, making with the interim dividend, a total of 20½ per cent. per annum free of income tax, the chairman said :

"The year 1921 has been one of considerable anxiety, of hope deferred, of frequent disappointment, and of unavoidable losses to most of those trading with the East. In India the absorption of accumulated stocks, which might reasonably have been anticipated, has been hindered by two principal causes. Political agitation, with unfair pressure on innocent traders, has at many points been exercised to prevent consumption of British goods—an agitation which should never have been permitted to assume the proportion it attained."

In this conservative statement the chairman of the Chartered Bank corroborates other reports on the injury to British trade by the spread of methods that were so successfully applied in China to penalize the Japanese. Continuing, he said :

" As regards the position in India generally. I am disposed to take the view that, provided the government of India act consistently with firmness and justice—as I believe they will—there is no reason to view the situation with undue apprehension. In all parts of the world—East and West, even in England itself—we see a widespread spirit of restlessness and discontent. There is a craving for change, a desire to attain what is in many cases unattainable, and a tendency to oppose all existing forms of government. This is an aftermath of the great war, and only time, with universal peace and goodwill, can bring about the contentment and good fellowship which should prevail between nations and between the component parts of those nations. This is especially applicable to India, and I look forward with confidence to the time when we can say that the people of India are showing that spirit of loyalty, comradeship, and goodwill which should exist between all members of the British empire. But to effect this we must have consistency in policy and firmness in administration. I do not deny that there are troubles at some points—serious troubles—in India, but they are partly agrarian, and can be dealt with by a just and firm government. The conclusion of a peace with Turkey on liberal lines, as recently outlined by Lord Curzon, will also help to alleviate the present strain."

In regard to trade conditions in China, Sir Montagu added :

" In China the offtake of imported goods has also been interfered with by extremely unsettled conditions in the interior of the country, and by the comparatively low rate of exchange. Serious losses have resulted, but the position has improved of late, and stocks are moving off gradually. Some time must elapse, however, before the position of the import markets either in India or China can be regarded with equanimity. Summarising the position of the Eastern markets generally, we may say that, while export markets mainly show very little life, import markets have improved to the extent that accumulated stocks are being gradually worked off, but it would be absolute folly on the part of shippers on this side to pour in fresh supplies which are not needed. The motto for all of us should be 'slow and sure' until the dark clouds of depression have disappeared, and the purchasing power of consumers has attained more nearly to normal levels."

* * *

Root on China

(From the presidential address by Elihu Root before the sixteenth annual meeting of the American Society of International Law, Washington, D. C., April 27, 1922.)

" THE four-power treaty was not enough, however, standing by itself, to make the new condition stable without some treatment of the causes of irritation which had arisen and which might be apprehended upon the continent of Asia. For the discussion of this subject four other powers having interests in the Far East, Belgium, China, the Netherlands and Portugal, also took part . . .

" Under the conventional arrangements with China there had developed a vast extent of beneficial trade and industry upon which multitudes of people in and out of China were dependent. It was evident that to attempt then to wipe out all the arrangements which I have described and put China immediately upon the footing of a full member of the society of nations unhampered in her trade, her administration, and her maintenance of order, except by the rules of international law, would be futile and disastrous, for there was no government in China competent to maintain trade, to administer justice to foreigners, or to protect foreign life and property. It was evident, too, that China must work out her own salvation, that no exercise of foreign power could accomplish the result. Four hundred and thirty million people are too great a mass to be reformed from the outside. If China is to possess her own territory with independence and control of her own destinies, she must learn to govern herself and to assert and maintain her own rights as a nation.

" Accordingly, the members of the conference addressed themselves to the task of helping China so far as it was possible in her struggle to achieve self-government . . .

Any one examining the treaties and resolutions will find that they uniformly sought a double object, first, to relieve the limitations and inconveniences flowing from the old conventional relations as far as was then practicable under the existing governmental conditions in China, and, second, to afford to all sections and parties of the Chinese people a helpful incentive to unite in the establishment of an effective and stable government by making specific provisions under which such a government, competent to perform its national duties, will be the means of bringing China into the full possession of the rights and liberties assured by international law to the members of the family of nations, just as Japan has been brought into that family.

" Personally I am a believer in the coming of that event. It will be a long, difficult process, for it requires the new education of more than four hundred million people, but I look to the future of that industrious, kindly, peaceful people, with their inveterate respect for individual and family rights, not as a yellow peril but as a great reinforcement, to the power of ordered liberty upon the domination of which the future of our civilization depends."

* * *

Don't Overlook Publicity!

THE Pennsylvania bankers' association is alive to the fact that foreign trade constitutes a most important factor in the permanent prosperity of the nation ; that all must co-operate in the effort to develop it along safe, permanent and profitable lines. Such co-operation demands accurate information and quick

service, and should be carried out with the idea of promoting friendly international relations along lines that make for peace. A foreign trade policy based upon sentimental regard for one nation while antagonizing another rich and profitable customer, can bring no lasting or beneficial results.

The Pennsylvania bankers' association were quick to sense the meaning of the Washington conference and the opportunities now before the nation to extend its foreign trade, and to this end organized a committee headed by Dr. J. T. Holdsworth, vice-president of the Bank of Pittsburg, who, by reason of his intimate grasp on foreign exchange problems, is recognized as one of the foremost experts in this field. In a very concise statement, Dr. Holdsworth spoke more truths than we have seen in the many recent papers which purport to emanate from foreign trade authorities, and concludes by saying that what Americans need is a fresh baptism of grit, initiative, perseverance and courage, and be ready to co-operate heartily in the development of their export and import business. And we will add something that Dr. Holdsworth overlooked, and that is, to be successful the American business man, banker, trader and manufacturer must make up his mind that one of the essential cogs in the wheels of trade is publicity, without which, he will get nowhere in the struggle for markets. Unless the American manufacturer supports an American publication that is carrying his load in foreign fields, he cannot hope to have his interests at all times defended as they should be. Without this whole-hearted support, an American publication cannot exist. Publicity, and the defense of national policies in foreign fields, is as much as part of the machinery of successful trade as the bank, broker, commission house or transportation line. Without that publicity and the sympathetic co-operation of newspapers designed to assist national trade, it is a very easy thing to lose the hold on a foreign market.

* * *

None of Our Business

THE following editorial from the "Official Organ of the American Chamber of Commerce for Brazil" is worth reproducing, for the benefit of foreigners in China. The Chinese must work out their own destiny in their own way. It should not concern any foreigner how she does this, or what party, leader, or policy wins in the present difficult period of unification. When the United States was engaged in settling its internal problems during the civil war, several European powers whose trade was disarranged attempted at various times to bring about conciliation. This finally led to a notification from President Lincoln to the powers concerned, that any overtures having for their object peace between the north and south, would be considered as an unfriendly act. China is entitled to the same consideration in settling her affairs in her own way. It is emphatically none of our business :—

"The political campaign, which is absorbing the attention of our Brazilian friends at present, comes closer to being none of our business than anything of which we can think, off hand.

"There are many lines of activity in this country which may be considered of legitimate interest to resident foreigners, but the election of the president of the republic is not included.

"The more or less painful labors, through which not only Brazil but every republic passes in the production of a new administration constitute a phenomenon which should be in no way unfamiliar to Americans. No one should be able to realize more acutely than an American that political campaigns generate heat and super-sensitive nerves. No one should be better able than an American to understand the resentment that is invariably aroused by 'the foreign vote.'

"A considerable number of Americans, as well as other foreigners, who have been decorated with wooden crosses in Mexico and Central America, would probably have been alive and prosperous to-day if they had not butted into local politics. The fact that they are now 'At Rest' indicates former ill-placed activity.

"One evil result of the assumption of a partisan attitude by any one American is that it may become noised about that such is the position of 'the Americans.' The acts of one fool foreigner may be sufficient in these times of stressed sensibilities to place a highly undesirable odium on his fellow countrymen.

"The facts and conditions which have raised the present political issues are but partially understood by foreigners, but one fact which is fairly obvious to even the most casual observer is that the Brazilians are capable of handling their own affairs fully as well as most peoples.

"Between now and next March, while the Brazilians are whooping it up for their candidates, there is an excellent opportunity for resident foreigners to confine their attention to their own business—if they have any."

* * *

Peking and the Consortium

MR. Hall's excellent article on the financial program of the new Peking cabinet would indicate that the day is drawing nearer when the consortium deadlock must be broken and negotiations initiated to relieve China's distressing financial situation. However, some time will elapse before the dreams of Peking can be realized. The first requisite to a foreign loan is unification, followed by recognition of the consortium by the Chinese government. As matters stand, the joint note from the British, American, French and Japanese legations at Peking to the Chinese foreign office transmitting the consortium dossier (dated September 28, 1920) remains unacknowledged. The first move after unification, is therefore an official acknowledgement of the friendly note of the powers, which explains in full the surface reasons for the creation of the consortium. Then, once a basis for official negotiations is established, all communications, conversations and conferences must be conducted openly and above board by the duly authorized minister of finance or his delegates. The day is passed when such negotiations can be carried on in secret by intermediaries. When these preliminaries are carried out, there is little doubt that the consortium will be ready to do business along lines that will safeguard not only the interests of China but those of the bondholders

Any premature attempt to negotiate a re-organization or funding loan before China is reunited would be fatal. As a matter of fact, such a loan could not be issued in the United States with any chance of success. It is only necessary to point out that the Canton government maintains a very intelligent and highly efficient publicity organization in Washington and that nine-tenths of all Chinese resident in America are active sympathizers with and contribute funds to the cause of Sun Yat-sen. The parades of protest and general hullabaloo on their part, coupled with a vigorous publicity campaign last year against the then suggested loan to Peking, warns us that such activities would be redoubled. Americans would be told that they were sacrificing republicanism or democracy to a military autocracy, and there is little doubt as to the effect of such arguments upon a people who view these problems largely from a sentimental angle. A loan to Peking, if made at all, would have to be carried by the bankers, with the prospect of it being repudiated at some time in the future. Obviously, American bankers would hardly care to assume responsibility of carrying the load of a long-term Chinese issue under such conditions, even if we admit that the state department would sanction it.

There is no more reason to believe that any of the other groups would interest themselves in a loan to the Wu Pei-fu cabinet unless the south is brought into line through reasonable compromise. Notwithstanding the inclusion of the Nishihara loans in the proposed refunding plan, which, we are told, is due to the desire of Wu Pei-fu to release China from any obligation to Japan, it is extremely doubtful if this would induce the Japanese government or its group to forego their fixed policy to refrain from financial intervention in China until unification is accomplished. Japan will take no more chances in financing any faction in temporary control of Peking, and if the readiness of Wu Pei-fu to recognize loans which his party have repudiated to date, is intended to influence

Japan into approving a loan pending unification, he will probably be disillusioned. Japan has greater interests at stake in the pacification and unification of the country than in the repayment of a loan of $180,000,000.

We have been informed that the British group has sent out encouraging feelers to the new government and that if a loan is made to the Wu Pei-fu cabinet it must be on their initiative. Obviously, the wish here is father to the thought. Conditions have changed since 1913, and it would be now impossible with America in the consortium to repeat the mistake of the reorganization loan which cemented Yuan Shih-kai's power as a military dictator and made possible the creation of the Peiyang military oligarchy. The Kuomintang cannot be eliminated and brushed aside as it was in 1913, without creating a split that would endanger the existence of the consortium and undo all the good work that has been accomplished to bring about international co-operation in the solution of China's difficulties. Public opinion in the United States, in Japan, in Great Britain itself, would not countenance another such unwarranted interference in the internal affairs of China. The South, and what it stands for, is a vital element in the present struggle and those who advocate a loan to the Wu Pei-fu cabinet should remember that this is China's problem, in which no other nation has the right to interfere. If unification again brings the Kuomintang into a position of power, and it fails to live up to the required standards, it is China's funeral. A loan that ignores this elementary factor in China would only tend to defeat its purpose and invite a continuance of the differences which have prevented a return to normal conditions in this country. For these reasons we believe that the stories circulated about the encouraging attitude of the British group towards financing Wu Pei-fu's funding loan are without foundation in fact, part of a propaganda to create a sentiment favorable to such a procedure.

China is making progress. There is no doubt of that. If left to themselves, the Chinese will find some solution to their difficulties acceptable to their own conception of what is right and proper.

* * *

Japanese Railways 1921

FROM the point of income alone the business of the Imperial Government Railways has been steadily increasing since the beginning of the great war. The reasons for this increase are, however, largely to be found in the increased mileage of tracks and the greatly increased charges for freight and passenger services. Thus while on the surface the results of operation were exceptionally good, an examination of the actual business fails to sustain the actuality of the improvement during the years of Japan's war prosperity.

For instance, in 1914, the average number of miles of track in operation was 5,538 ; in 1921 this had increased to a little more than 6,600 miles, by slightly more than 20 per cent. But passenger fares were raised on July 16, 1918 by 50 per cent., and again in February 1920 by 50 per cent. of the fares charged in 1918. Freight rates were raised by 20 per cent. on September 15, 1918, and on January 10, 1921, the classification of freight was revised in such a manner as to raise the average rate by 28 per cent. Compared to before the war freight rates, this was an increase of 53.6 per cent. Considering the natural effects of these increased rates on aggregate income as well as the increased business brought about by the extension of operated lines, the rise in income since the beginning of the war is not particularly extraordinary.

Passengers Carried Increasing Annually.—Statistics of passenger business show that the number of passengers carried on the Imperial Government Railways has been increasing every year between 1914 and 1921, and a comparison of the traffic in the two years shows the passenger traffic of 1921 to be 2½ times greater than that of 1914.

TABLE I.

Passengers carried and Passenger Income 1914-1921.

	No. of Passengers	Increase compared to previous year. Per cent.	Income Yen	Increase compared to previous year. Per cent.
1914 ...	166,090,000	—	44,670,000	—
1915 ...	172,290,000	3.7	57,280,000	4.7
1916 ...	197,040,000	14.3	64,770,000	13.1
1917 ...	245,240,000	24.4	84,730,000	30.8
1918 ...	269,590,000	9.9	120,750,000	42.5
1919 ...	331,120,000	22.8	162,820,000	30.0
1920 ...	378,550,000	14.3	204,710,000	25.7
1921 ...	418,000,000	10.4	211,540,000	3.3

In this manner traffic has increased, but the passenger fares have also increased. Since 1919 both the rate of increase in passengers carried and in income has been steadily falling, indicating that the number of passengers traveling short distances has increased while the long distance travel has fallen off materially.

Freight Business

Along with a steady increase in the tonnage carried income from freight traffic has shown a steady advance for several years past, but the class of freight carried has recently shown a great change.

In 1915 there was a material falling off in freight carried. In 1914 the Imperial Government Railways handled 35,700,000 tons, but in 1915 the total freight carried was only 34,160,000 tons, a decrease of 43 per cent. In 1916 the business of the country began to feel the effects of the growing war prosperity and there was a considerable increase in the tonnage offering. For the first three months of 1916 the average tonnage carried was 3,000,000 tons a month ; for the last three months, 3,750,000 tons a month. The year's total tonnage was 40,000,000 tons ; monthly average, 3,270,000 tons. Compared to 1914 this was a 12 per cent. increase.

With the continuing growth of war prosperity the tonnage carried rose year after year until during one month in 1919 the total carried reached 5,000,000 tons.

In the second half of 1920 the effects of the great panic caused a sudden falling off in tonnage. Until May, 1920, the tendency was towards increased freight business, tonnage that month reaching the highest amount ever known on the Japanese railways, 5,140,000 tons. Thereafter there was a most decided falling off. From 1915 on there had been an annual increase of 14 to 15 per cent., but when compared to 1919 tonnage in 1920 showed a falling off about 5 per cent.

The total tonnage moved in 1920 was 53,750,000 tons. This fell in 1921 to 52,100,000 tons, a decrease of 4,000,000 tons compared to 1918, about 7 per cent.

Freight Moved on Imperial Government Railways 1913-1921.

	Tons
1913	35,079,000
1914	35,704,000
1915	34,168,000
1916	39,294,000
1917	45,549,000
1918	50,730,000
1919	56,206,000
1920	53,751,000
1921	52,105,000

Freight According to Classification.—The greatest decline in tonnage has been in the amount of coal moved. The decrease in the total tonnage moved in 1921 compared to 1920 is 3 per cent. But the decline in coal tonnage moved was more than 11 per cent., so that the real reason for the falling off of total tonnage in 1921 is to be found in the decline of the coal trade. Coal was 34 per cent. of all cargo carried in 1919 and 1920, but in 1921 it was only 31 per cent. of all cargo, a decline of 3 per cent., the actual percentage of the falling off of all tonnage.

Because of the extremely bad condition of all manufacturing industries, the nation's coal consumers, no early revival of the coal trade, and consequently of the coal carrying trade, can be expected.

After coal, in 1921, the greatest falling off of tonnage is seen in ore, iron and steel, salt, stone, building materials, cement and raw cotton. These commodities have made the greatest tonnage decreases, but compared to the falling off of coal tonnage, their declines are all small. In 1921, however, certain commodities showed noticeable increases in tonnage; rice, limber, fertilizers, charcoal, fresh fish, paper, Japanese and foreign; cotton cloth and yarn, sugar, kerosene, and *saké*, when compared to their tonnages moved in 1920.

Most Important Commodities carried on Japanese Railways:

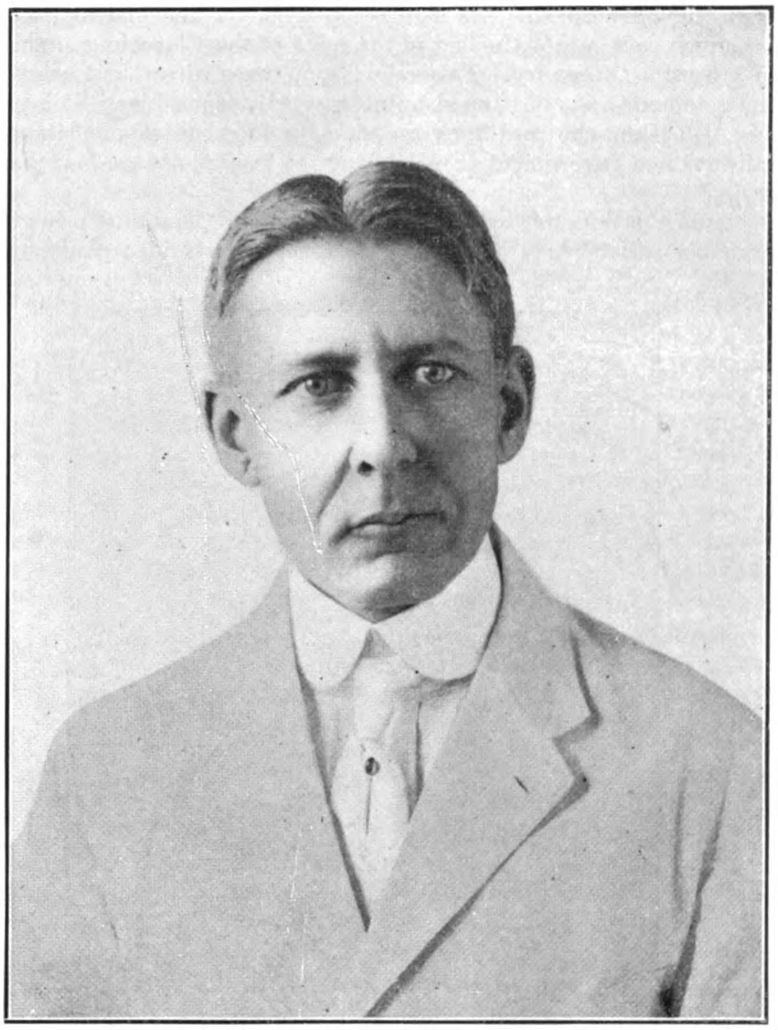
	1921 Tons	1920 Tons	Increase or decrease Tons	Rate Per cent.
Rice	2,392,000	1,957,000	435,000	22
Lumber	5,158,000	4,984,000	174,000	3
Ores	680,000	767,000	87,000*	11
Coal	16,868,000	18,326,000	1,958,000	11
Iron and steel	614,000	633,000	19,000*	3
Fertilizers	2,260,000	2,016,000	245,000	12
Charcoal	1,281,000	1,094,000	187,000	17
Food salt	455,000	461,000	6,000	1
Fresh fish	458,000	326,000	132,000	40
Paper(foreign & Japanese)	355,000	205,000	149,000	73
Dried fish	307,000	221,000	85,000	39
Cotton yarn and cloth ...	654,000	375,000	279,000	74
Wheat	550,000	472,000	79,000	17
Fresh fruit	319,000	289,000	30,000	10
Fuel wood	571,000	513,000	57,000	11
Stone building material	704,000	705,000	1,000*	--
Sand and pebbles ...	2,590,000	1,588,000	1,001,000	63
Petroleum, etc.	516,000	470,000	43,000	9
Sugar	373,000	280,000	93,000	33
Alcoholic beverages ...	626,000	415,000	210,000	51
Cement	553,000	559,000	6,000*	1
Raw cotton	241,000	248,000	7,000*	3
Grains	314,000	305,000	8,000	3
Others and total... ...	52,175,000	53,662,000	1,487,000*	3
Income	Y.161,571,000	Y.126,932,000	Y.34,639,000	26%

*Decrease.

A Scientific Products Laboratory for China

IT is universally conceded that the greatest achievement of American rule in the Philippines was the establishment of the bureau of science with its wonderful record of efficiency in investigating tropical diseases and discovering and applying new remedies and serums which kept down the death rate of the people and prevented plagues which yearly decimated the domestic animals. From the start, this bureau held the attention of and won the highest praise from the world of science for the thoroughness of its studies, conclusions and reports. The latter stand as the most valuable collection of records of research into tropical science that exists to-day, a permanent testimonial to the painstaking care of those who conducted the investigations and drew up the reports. Manila, the islands and the Far East in general, are heathier places to live in as a result of the labors of this group of American scientists, under the capable direction, first of Dr. Paul C. Freer, and later on of Dr. Alvin Cox. The bureau of science with its wonderfully equipped laboratories was the foundation upon which the health service of the islands was erected, the pride of the American administration, the sign of our progress and civilization. One of the results of the Harrison administration was to create conditions that caused the retirement of Dr. Cox and make the bureau more and more dependent on Filipinos, with the same results that characterized their administration of other important bureaus. The loss to the Filipinos may have resulted in a gain to China. It brought Dr. Cox to this country with the idea of investigating the possibility of establishing a commercial laboratory in Shanghai that would do for the Chinese what the bureau of science in Manila did for the Philippines.

Without minimizing the good work along these lines accomplished by others, or detracting in any way from the merits of foreign manufactured products which find a large and increasing sale in this market, it is fair to state that the necessity of such laboratories is a crying need in China. It is a virgin field, vast in its possibilities for scientific research. Strange and rare diseases unknown to Western medical science call loudly for special scientific investigation and the discovery of remedies and serums to combat their ravages.



Dr. Alvin J. Cox,

Formerly Director of the Bureau of Science in Manila

There is not only great need of, but an excellent commercial opportunity for, an institution that will specialize in the common products which hold a real and permanent place in the materia medica, such as vaccine virus, antidysenteric, antitetanic, antidiphtheritic and normal horse serums, and antirabic, gonococcus and autogenous vaccines, etc. Such an institution will be a great boon to China.

In normal times, the government of China would no doubt co-operate in facilitating the manufacture of biologic products and other similar enterprises which have a distinctly governmental significance. It should be an easy matter to prove to the government the value of establishing vaccination headquarters in each province, and reduce the ravages of smallpox in China to almost nil. Vaccine virus for the vaccination of 400,000,000 people would be a large order, taxing the capacity of all the laboratories in the world to fill. Yet some day China must come to it, the same as all other nations, and the vaccine will be supplied from laboratories established in China, if the order is to be filled.

WU PEI-FU'S FINANCIAL PROGRAM

By Josef W. Hall

IT has been years since China has undergone a political overturn of so sweeping a nature. More important than the eradication of the dominance of Chang Tso-lin from Chinese national affairs is its by-product: the turning out of the old mandarinate from Peking, which has culminated in the retirement of President Hsu Shih-chang. This has a direct bearing on financial matters inasmuch as it means the end of the reign of the Chiaotung clique in government finance. This reign, sometimes direct and sometimes indirect, has continued uninterruptedly since Liang Shih-yi and Yeh Kung-cho and their associates gained control of Chinese railways and government banks during the last days of the Manchu *regimé*.

Immediate visible evidence of the fall of the Chiaotung princes probably will be seen in two eventualities: firstly in a complete new policy of government railway administration; and secondly in the separation of the Bank of China or Bank of Communications from the government, or the amalgamation of the two banks—leaving but one national official banking institution. The minister of communications, Mr. Kao En-hung, has been set the difficult task of eliminating Chiaotung and other political influences from his ministry and placing government communications upon a purely business basis of administration. His first act has been the lopping off of some three million dollars silver per year from the payroll which involves the abolition of all superfluous positions, whether advisory or managerial. The directorates general of five railways have been abolished.

Mr. Kao is living up to the letter of contracts with foreign financiers providing for these positions, by conferring upon the managing directors the concurrent title of director general. Mr. Kao's policy towards the railways, while not expressedly that of unification, is one of economy through amalgamation of various departments concomitant to traffic such as the police and sanitary services.

General Wang Shih-chen (the Dragon), new Premier of the Peking Government

Tung Kang, Peking's new Minister of Finance

In the ministry of finance a more complicated situation is faced. There the new minister, Tung Kang, must reckon with the open hostility of the Chinese Chiaotung bankers whom he has injured and implicated in his recent graft investigations, the apathy of the foreign loan market due to defaults on foreign obligations, the decrease in customs revenue caused by adverse exchange, and the crushing burden of usury which the government is obliged to pay to its miscellaneous creditors.

One of the first schemes which the new ministers who are carrying through General Wu Pei-fu's policies plan to execute, is a gigantic refunding loan for the purpose of regularizing all obligations and reducing the usury to a normal interest. It is hoped through this means to effect a saving of twenty million dollars per year in interest on four hundred million dollars of unfunded loans. The success of this scheme is, of course, dependent upon the status of Chinese credit, both domestic and foreign, but particularly foreign.

The plan of the new Chinese cabinet is to fund four hundred million dollars silver worth of public loans, comprising practically all of the national indebtedness not under process of repayment from dependable revenues like the customs. The fund is proportioned about as follows: domestic issues, two hundred and forty million; American and European loans, eighty million; unsecured Japanese obligations, one hundred and eighty million.

These last, it will be readily recognized, are the Nishihara loans. The determination of the new *regimé*, which is generally regarded as anti-Japanese, to manfully meet these obligations which previous *regimés*, freely designated as pro-Japanese, have declined to so much as recognize, should create a sensation as well as cause

a great revulsion of feeling throughout Japanese business circles. How hard Japanese bankers have been hit by their inability to collect principal and interest on this money lent by them under the influence of their government for purely political reasons and spent or frittered away by corrupt Chinese officials, is a story the half of which has never been told. Nothing which could be done would contribute so much toward rallying the good will of the substantial element in Japan to the new *regimé* in China as the execution of this policy, which is the outgrowth of General Wu Pei-fu's desire to place all relations with Japan upon a clear and definite basis.

There is another phase to the refunding scheme which greatly concerns the international prestige of China. As is generally known, the Washington conference provided for the assemblage in China in January of next year of an international commission for the discussion and determination of the conditions which are to apply to the two and one-half per cent. increase in the customs tariff. Although nothing has been put into black and white to this effect, it is understood by both Chinese and foreign interests involved that the increased revenue is to be pledged to the amortization of various defaulted and uncovered foreign obligations before any part of it passes into Chinese hands. This, of course, virtually means that the foreign powers are to pay China's debts for her. It is, however, greatly saving of Chinese prestige as well as much more agreeable all around to have the Chinese themselves propose such a solution. The obligations to be embodied in the four hundred million dollar refunding loan, with the exception of the Nishihara loans and the Marconi issue, are already covered by good security and provided with revenues for their liquidation, but any deficiency in securities or revenues, according to the plans of the framers of the scheme, is to be met by the expected increase in the customs tariffs.

Many details of the scheme remain to be considered, although some of the most obvious difficulties have already received full discussion. In harmony with the policy of the new finance minister the public will be kept in knowledge of all decisions. Mr. Tung Kang states that several months will be required to develop this scheme. " I am not in favor of loans," said Mr. Tung Kang, " and I believe that a great majority of them in the past have been made for the benefit of the borrowing officials rather than to meet the exigency of the country. However, what we now propose is not a loan to be spent upon unproductive expenses or even upon construction projects but rather a funding of the present obligations against the government, both foreign and domestic, which have been contracted in such an irresponsible manner as to gravely impair the standing of the nation. And we hope, as well, to effect a great saving in interest. The first problem is to eradicate corrupt influences in the ministry of finance and its many subsidiary bureaus, and fill the financial and tax collection posts in Peking and throughout the provinces with men of integrity. This is no quick and easy task. Having attained something toward its accomplishment we will then be in a position to go ahead with our scheme."

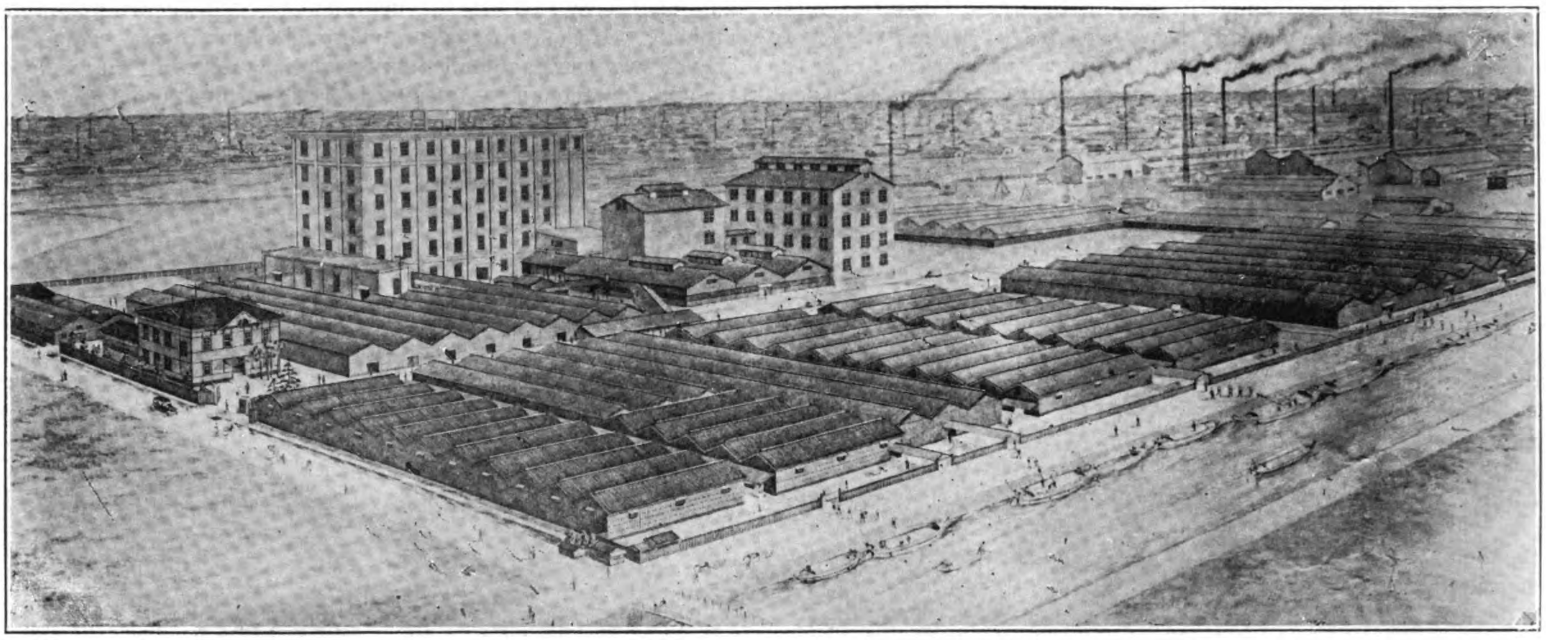
It is not planned to borrow to meet current administrative expenses. It is hoped by Messrs. Tung Kang and Kao En-hung that the savings effected by the abolition of superfluous posts and the introduction of measures of efficiency will enable the government to pay its way as it goes. As a means of working toward this end the ministries and departments of government and the railways are being put back, as far as is practicable, upon the budgets of the first year of the republic. An idea of the savings which it is hoped to effect through this change was given by Mr. Kao En-hung who spoke of two railways as examples. The operating expense budget for the first year of the Kin-Han Railway was thirty-four million dollars. This year it is forty-seven million, an increase of thirteen million, or more than forty per cent. The Peking-Mukden Railway's budget of operating expenses has increased within the same period of time by eighteen million dollars per annum. Mr. Kao hopes to effect a saving of at least thirty million dollars per annum on railway expenses. This, considering the pruning which he is making in budgets, seems to be a modest and safe estimate. At the same time he plans to save ten million dollars per year on the administrative expense of the ministry—a rather more difficult problem. If the railways can be brought back to the earning capacity of two years ago and the new audit system introduced by Mr. Kao proves an effective safeguard for the surplus profits, the government should be better off from this source by some twenty to forty million dollars yearly, which have heretofore gone into the pockets of the Chaotung clique.

The loan refunding scheme takes care of all government obligations, with the exception of payments due British, Japanese and American firms for materials supplied for the government railways. Those are said to total something like twenty-five million dollars. They are, however, secured upon the materials themselves and the railway revenues are pledged for their liquidation. The moment that efficient railway management and the return of peaceful conditions provide earnings surpassing operating expenses, these obligations will care of themselves.

The only remaining financial problem of any magnitude is that of the support of the troops. It would appear that henceforth the only military forces which are to receive recognition and support from the Peking government are to be the armies of General Wu Pei-fu. The cabinet in its last meeting pledged General Wu one million dollars per month for the upkeep of his forces in return for which Wu is to release his hold upon the Hupeh salt revenues and the revenues of the Peking-Hankow Railway, allowing these to revert as originally to the central government. The minister of finance has in turn requested General Wu to enforce payment of the proper provincial contributions to the central government's upkeep. The general has replied that he is prepared at any time to obey a reasonable mandate of the government in event of the recalcitrance of provincial officials.

General Wu Pei-fu

The Military leader of the Chihli or Peiyang Party, who faces the grand opportunity to unite China, and restore her prestige amongst the nations.



The Plant of the Toa Flour Milling Company at Tokyo

Japanese Flour Mills

By H. C. Hugins

THE Japanese flour milling industry made its first great step forward after the Russo-Japanese war. Its next period of development began with the outbreak of the great war. Before the Russo-Japanese war the whole production of all Japan's mills was only 750 barrels in a day of 24 hours. After the war this had increased to 8,710 barrels in 1911, and gradually continued to increase until just before the great war, in 1914, the productive capacity of all the flouring mills in Japan was 9,060 barrels. To-day, in 1922, this has risen to 21,000 barrels, a day of 24 working hours.

According to statistics published by the department of agriculture and commerce, in 1905, the total productive capacity of all the mills was 1,300 barrels, every 24 working hours. In the Kwanto district (Eastern Japan), there were then only nine companies operating 14 mills producing a total of 1,100 barrels a day. In the Kwansai district (Western Japan, with Osaka as a centre), there were seven companies operating seven mills producing only 200 barrels. The oldest of all these mills is the Ogibashi Flour Mill belonging to the Nihon Seifun Kabushiki Kaisha (Japan Flour Milling Co., Ltd.), opened in September, 1897, with a capacity of 200 barrels. Practically all the other companies operating before the Russo-Japanese war were established in 1901. Just after the outbreak of that war there were four companies in Ogata, Sapporo, Nagoya and Osaka, established in 1905, and together with the production of the old concerns the total production of the whole country then reached 5,200 bags a day, 130,000 bags a month of 25 days, and 1,560,000 bags a year.

All the factories mentioned were operated by power other than primitive water wheels, and their gradual development slowly effected a reduction in the output from the primitive mills scattered all over the country in every wheat producing centre. At that time these primitive mills were very active supplying war demand, and they produced from 8,000,000 to 9,000,000 bags a year.

Flour was first produced by the primitive water wheel mills, then large quantities were imported to fill up the nation's needs, particularly from the United States. In 1905, more than 4,990,000 bags were imported, and when modern mills were first built they produced not more than 10 per cent. of all the flour used in Japan.

The number of mills and their capacity, in 1905, and in 1911, is compared in the following table :—

Name of Company owning Mill and Mill's Name.	1905 Capacity in 24 Working Hours	1911 Capacity in 24 Working Hours	Location of Mill.
Kwanto District :—			
Nihon Seifun K.K. :			
Principal Mill...	400 Bbls.	400 Bbls.	Tokyo
Onagigawa	— ,,	800 ,,	,,
Sunamura	— ,,	600 ,,	,,
Nisshin Seifun K.K. :			
Tatebayashi	100 ,,	1,000 ,,	Tochigi
Utsunomiya	100 ,,	400 ,,	,,
Yokohama	— ,,	400 ,,	Kanagawa
Toa Seifun K.K. :			
Principal Mill...	— ,,	700 ,,	Tokyo
Sapporo	200 ,,	200 ,,	Hokkaido
Shiraishi Kofun K.K.	65 ,,	65 ,,	Fukushima
Uzen Seifun K.K.	50 ,,	60 ,,	Yamagata
Matsumoto Seifun K.K. ...	65 ,,	65 ,,	Saitama
Matsudo Seifun K.K.	40 ,,	40 ,,	Chiba
Ogata Seifun K.K.	30 ,,	40 ,,	Kanagawa
Kanagawa Mogi Kojo	50 ,,	— ,,	,,
Total ...	1,100 Bbls.	4,760 Bbls.	
Kansai District :—			
Masuda Seifun K.K.	— Bbls.	1,000 Bbls.	Hyogo
Nihon Seifun, Hyogo Mill ...	— ,,	700 ,,	,,
Asahi Seifun K.K.	— ,,	200 ,,	,,
Nihon Seimai Seifun K.K. ...	— ,,	250 ,,	Kobe
Nagoya Seifun K.K.	100 ,,	100 ,,	Nagoya
Osaka Masuda Seifun K.K. ...	100 ,,	100 ,,	Osaka
Dairi Seifun	— ,,	1,600 ,,	Moji.
Total ...	200 Bbls.	3,950 Bbls.	
Grand Total ...	1,300 Bbls.	8,710 Bbls.	

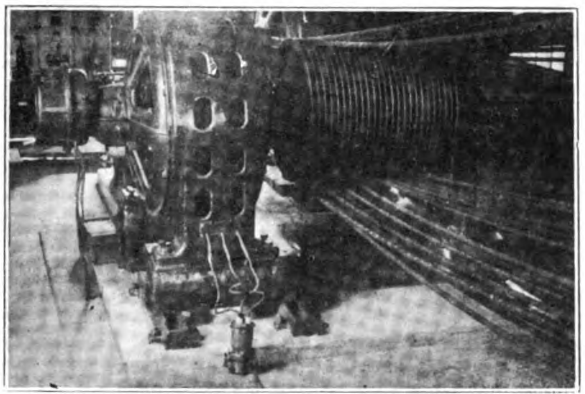
The capacity of the power mills developed rapidly until 1911 when it reached 8,710 barrels. The Nihon Seifun K.K.'s mill at Onagigawa was opened in April, 1908, at Sunamura in October, 1907, and at Hyogo in July, 1907. The Yokohama mill of the Nisshin Seifun was opened in August, 1909, and the Toa Seifun's mill at Tokyo was in operation in January, 1908. The Masuda mills and the Nihon Seimai Seifun mill were opened shortly after the Russo-Japanese war began.

In 1911 production of flour had reached 34,840 bags a day of 24 working hours. Annual production was 10,452,000 bags. One of the results of this great increase in power mill production was to drive the small water-driven flour mills out of business, and in this same year their total production fell below 7,500,000 bags. Imports also declined to only 798,000 bags. Power mill production and the old water wheel mill production were about the same, but import fell to only one tenth of the power mill production, one twentieth of the total production of flour in all Japan. The reason for this great change in the position of imports between 1905, when about 4½ million bags were imported, and 1911 when only about 800,000 bags were purchased abroad, is to be found in the revision of the tariff charges on flour which, at first taxed only 70.3 sen per 100 *kin* (133-lb.), was after the revision taxed Y.1.50 per 100 *kin*, an advance of more than 100 per cent. Wheat was not so adversely affected. Taxed at first only 50.3 sen per 100 *kin*, after the tariff revision it still was very lightly taxed at 57 sen per 100 *kin*. Naturally this stimulated the production of flour barrels a day, a total daily productive capacity of 9,060 barrels every 24 hours. This was an increase of only 350 barrels a day since 1911.

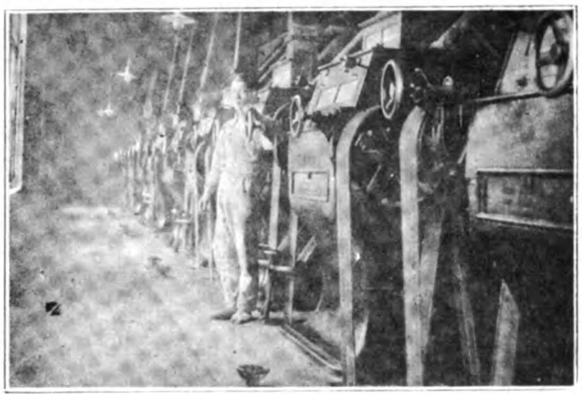
To-day, in 1922, many of the old companies have increased their equipment and raised their capacity. Many new companies, too, have added their production to the nation's flour supply. In the Kwanto 12,540 barrels, in Nagoya 1,830 barrels, in the Kwansai 4,800 barrels, in Kyushu, 2,450 barrels, a total of 21,620 barrels, can be milled every 24 hours. This is an increase of 220 per cent. compared with 1914. Production in one day is 97,290 bags, or 29,187,000 bags a year. If the actual potential capacity of each factory were only 80 per cent. of this quantity it would still be 23,350,000 bags a year. However, under any circumstances, at the present time, the production of the Japanese flour mills is in excess of the needs of the country. Productive capacity of Japanese flour mills, 1914 and 1922.

The domestic demand to-day requires only 13,500 barrels a day. Consequently there is always an excess of production. Since the great war export has almost ceased, and rate of domestic consump-

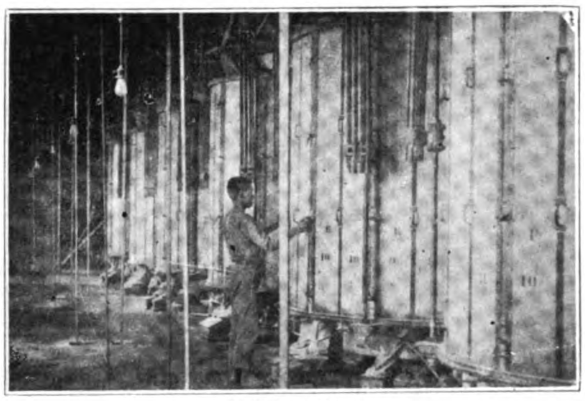
THE TOA FLOUR MILL



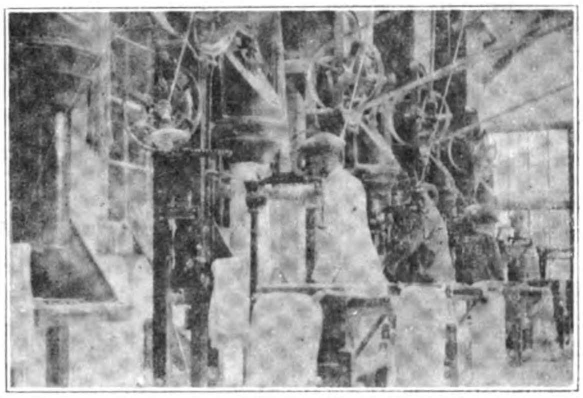
Power Room



Roller Mill Floor



Bolting Floor



Packing Room

at home, and raw material took the place of manufactured flour in the country's imports.

From 1907-1908 on so many factories were built that production eventually passed the point where the Japanese nation could absorb it. Naturally prices fell, and the trade was badly hit. Matters dragged on in a very indeterminate state until 1911 when the Nihon Seifun K.K., Nisshin Seifun K.K. and the Toa Seifun K.K., entered into an agreement to limit production from December, 1911 to May, 1912, to one-half of their potential capacity, and to fix prices at which they would sell their competing brands.

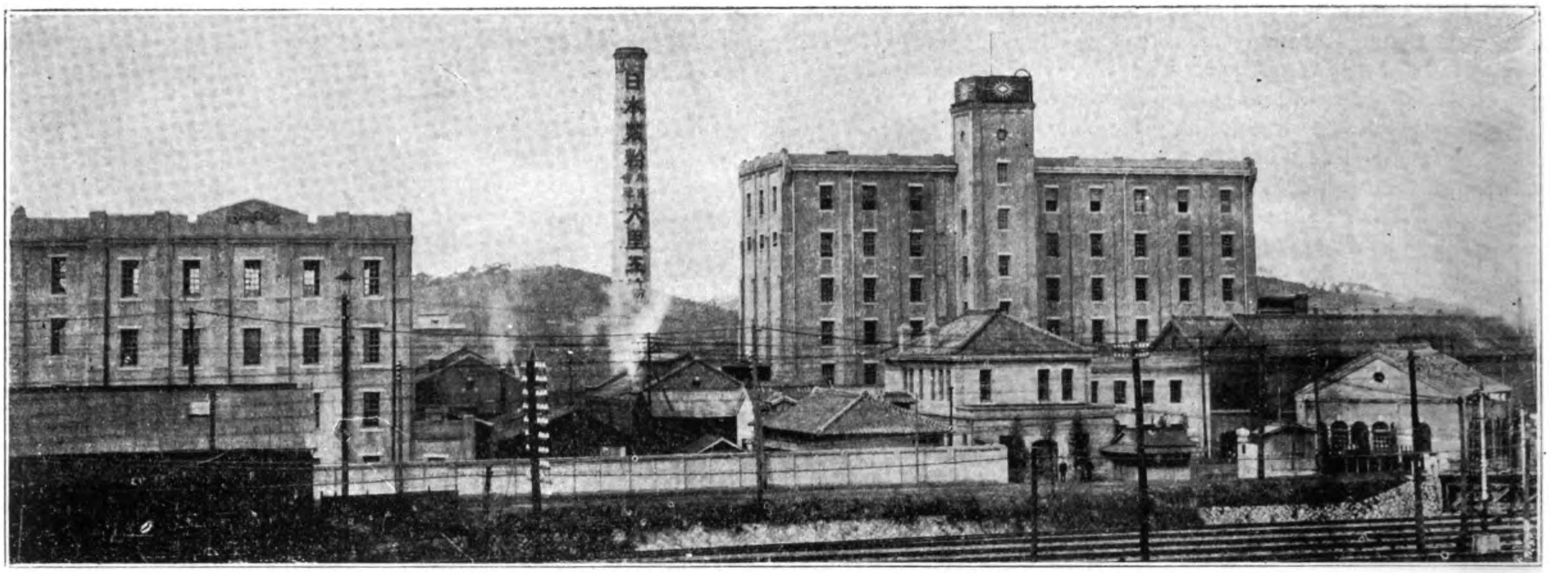
Just after the Russo-Japanese war, because of the competition off the domestic brands, imported flour fell into a very bad way indeed. And from that time on until the outbreak of the European war, there was practically no increase in demand for Japanese flour, either at home or abroad.

In 1914, the productive capacity of the machine power mills in the Kwanto was 5,080 barrels a day, in the Kwansai it was 2,250 barrels a day, in Kyushu, 1,600 barrels a day and in Nagoya 130 tion despite great efforts made to persuade the Japanese people to eat bread in place of rice, is not increasing at any perceptible rate.

For a time raw material has been difficult to obtain, and most milling companies were having a hard time of it. Small companies were no longer able to carry on their operations, and at the end of 1921, actual production was less than 60 per cent. of the potential capacity of the mills, about 14,080,000 bags a year.

Productive Capacity of Japanese Flour Mills

Name of Company.	1914 barrels per day	1922 barrels per day	Location of Mill.
Kwanto District :—			
Nihon Seifun K.K. :			
Ogibashi Mill	400	—	Tokyo suburbs.
Onagigawa Mill	800	1,150	,, ,,
Sunamura Mill	600	800	,, ,,
Sendai Mill	—	100	Sendai
Sapporo Mill	200	300	Hokkaido
Takasaki Mill	—	600	Gunma prefecture
Koyama Mill	—	500	Tochigi prefecture



Dairi Mill of the Nihon Flour Company, Capacity, 1,500 barrels per day

Name of Company	1914 barrels per day	1922 barrels per day	Location of Mill.
Kwanto District :—			
Toa Seifun K.K. :			
No. 1 Mill	700	900	Tokyo suburbs
No. 2 Mill	—	2,100	,, ,,
Nisshin Seifun K.K. :			
Yokohama Mill	400	600	Kanagawa
Utsunomiya Mill	400	500	Tochigi prefecture
Tatebayashi Mill	1,000	1,200	Gunma ,,
Mito	—	700	Ibaraki ,,
Takasaki...	—	700	Gunma ,,
Matsumoto Seikoku Seifun K.K. :			
No. 1 mill	65	75	Saitama prefecture
No. 2 mill	200	200	,, ,,
No. 3 mill	—	500	,, ,,
Tsuchiura Seifun K.K.	30	50	Ibaraki ,,
Matsudo Seifun K.K.	65	65	Chiba
Shiraishi Kosan K.K.	65	65	Fukushima ,,
Uzen Seifun K.K.	60	60	Yamagata
Musashi Seifun K.K.	—	200	Kawagoe
Nitta Seifun K.K....	—	200	Gunma ,,
Saitama Kogyo K.K.			
Old Mill...	120	120	Saitama ,,
New Mill...	—	120	,, ,,
Chiyoda Seifun K.K.	—	300	Chiba
Sagami Seifun K.K.	—	100	Fujisawa
Nihon Kagaku Seifun K.K. ...	—	50	Chiba
Matsuda Seifun K.K.	—	30	Hamamatsu
Iwate Seifun K.K.	—	30	Senhoku district
Ryomo Seifun K.K.	—	200	Sano
Total 17 companies ...	5,080	12,540	
Aichi District (Nagoya as centre) :—			
Nisshin Seifun K.K. :			
Nagoya Mill	—	1,000	Nagoya
Shikishimaya Seifun K.K. ...	—	200	Handa
Mikawa Seifun K.K.	—	100	Okazaki
Nagoya Seifun K.K. :			
No. 1 Mill	100	200	Nagoya
No. 2 Mill	—	300	,,
Komiya Seifun K.K.	30	30	Miye prefecture
Total 5 companies... ...	130	1,830	
Kansai District :—			
Masuda Seifun K.K.	1,000	1,800	Hyogo
Nihon Seifun K.K., Hyogo Mill ...	700	1,200	Hyogo
Asahi Seifun K.K.	200	—	Kyoto
Nihon Seimai Seifun K.K. ...	250	300	Kobe
Masuda Seifun K.K.	1,000	1,000	Osaka
Nisshin Seifun K.K.			
Okayama Mill	—	1,000	Okayama
Uno Mill	—	200	Osaka
Shikoku Seifun K.K.	—	50	Tokushima
Awa Seifun K.K.	—	50	,,
Sakade Seifun K.K.	—	100	Kagawa prefecture
Total 9 companies... ...	2,250	4,800	
Kyushu District :—			
Nihon Seifun K.K.			
Dairi Mill	1,600	1,500	Dairi
Kurume Mill	—	750	Kurume
Kyushu Seifun K.K.	—	200	Fukuoka prefecture
Total 2 companies... ...	1,600	2,450	
Grand Total 30 companies	9,060	21,620	

Millers say that the strong point in favor of the profitableness of flour mills is that they cost but little to erect when compared with other manufacturing industries, and also, that they require only a small labor force. But if production must be limited the business can not be such a fine one as they like to declaim. New mills erected since 1918 have been erected at very high costs, and the results of their business operations have been very dissatisfying to the shareholders.

Just at present raw material is high, and the manufactured product is cheap, so that the future of the flour industry is very problematic.

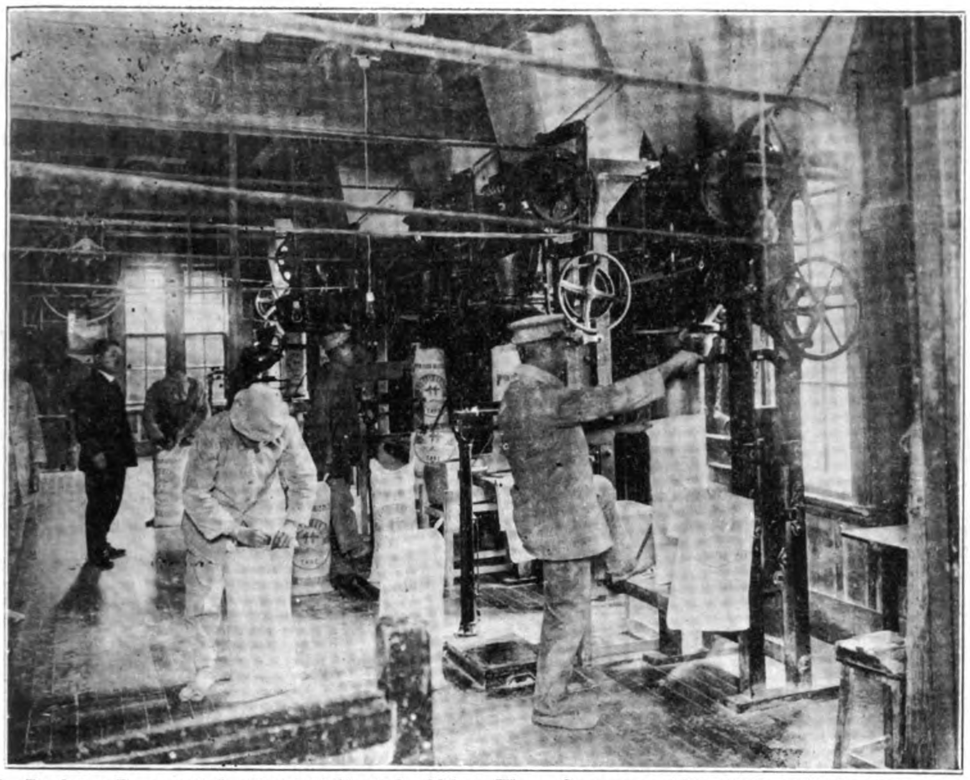
Flour Market To-day

Thanks to the period of seeming prosperity last year, from September, 1921, the flour industry took on a new lease of life. The price of flour bamboo brand, at one time reached Y.4.50 a bag. But during the first ten days of October, 1921, the price of flour in Japan took a heavy slump due to the decline in the price of wheat abroad, and also to the break in rice prices on the exchanges at home.

Since October, 1921, therefore, the price of flour has been continuously on the down grade, until it reached in January of this year the extremely low price of Y.3.70 a bag. But this low price helped the industry to recover because demand set in which raised prices by the middle of February to Y.4.25 a bag.

The recovery was largely due to the rise in the price of foreign-grown wheats. Australian wheat at one time quoted at Y.5.80 per 100 *kin* (133-lb.), C.I.F. Yokohama, recovered to Y.7.80. United States wheat rose from Y.6.00 to Y.8.00 per 100 *kin,* while Canadian rose in one bound from Y.6.20 to 8.90, C.I.F. Yokohama. The rise in price for practically all foreign wheat was approximately Y.2.00 per 100 *kin.* Japanese wheat, which had been very weak, at once took advantage of this situation in the foreign wheat market and rose in price, thus stimulating the market price of flour.

Then the very severe drop in rice the end of February depressed the flour market again, prices falling to Y.4.10 a bag. But foreign wheat more or less controls the actual price of flour in Japan, and foreign wheat continues to maintain high prices. And just at



Packing Room of the Dairi Mill of the Nihon Flour Company, Allis-Chalmer's Machinery

present summer demand is ruling the market, and this makes the prevailing market tone extremely optimistic and strong.

The recovery in the price of flour again attracted public attention to the flour milling companies on the stock markets. All flour issues registered market rises. The Nihon Seifun K.K. shares had been pushed down below par during the time of low-priced flour, but they have recovered and now stand at something like T.56.00, which is Y.6.00 above face value. This is a recovery of Y.18.00 compared with the low point reached in 1921. The Toa Seifun K.K. and the Nihon Seifun K.K. shares also rose on 'change.

Market Quotations of Leading Flour Issues

Company name	Paid Up Value	Low, 1921	High, 1922.
Nihon Seifun K.K. ..	Y.50.00	Y.38,00	Y.56.00
Nisshin Seifun K.K. ..	50.00	78.00	103.00
Toa Seifun K.K. ..	25.00	32.00	39.00

Because of the financial depression and the low price of flour, at a time when the cost of wheat was above the level at which it could be milled at a profit in Japan, the flour mills had a bad time of it for a while. Japanese-grown wheat was also at such a price that it could not be milled at all. Consequently all the Japanese companies turned their attention to buying foreign wheat at as low a price as possible. This was about the only way they were able to make both ends meet with any profit, even though it was very small.

In 1921 the importations of foreign wheat amounted to 293,000 tons, or 1,758,000 *koku*. This is an increase of 400,000 *koku*, compared with 1920. Most of this wheat was grown in the United States and Australia.

This foreign wheat was not only used to mix with Japanese-grown wheat, but in many instances it was used to replace the Japanese wheat entirely. This tendency to replace Japanese wheat with foreign wheat became more and more marked until the orders for wheat placed this year already exceed the amount bought in 1921.

Excluding the amount already imported the quantity to be shipped from March, 1922, is estimated at something like 295,000 tons, or 1,770,000 *koku*, from the United States and Canada and Australia.

Wheat Ordered for Shipment, 1922

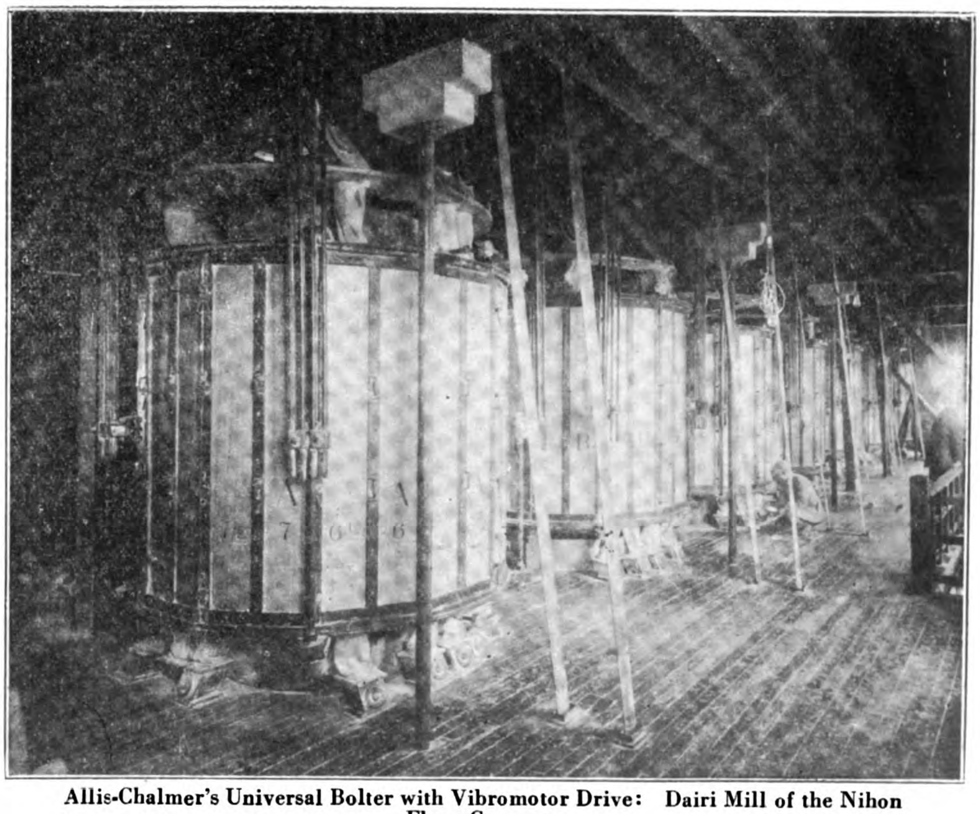
Country of Origin	Quantity	Value
Australia ..	180,000 tons	Y.18,000,000
United States	45,000 ,,	4,200,000
Canada ..	70,000 ,,	7,000,000
Total	295,000 tons	Y.29,200,000

Australian wheat gradually fell in price towards the end of 1921 because of the fears of Australian wheat growers about the future of prices after the decontrol of foodstuffs in October last year. Because of the low price of Australian wheat, Canadian and American wheat, assisted by the rise in the Anglo-American cross rate, fell also.

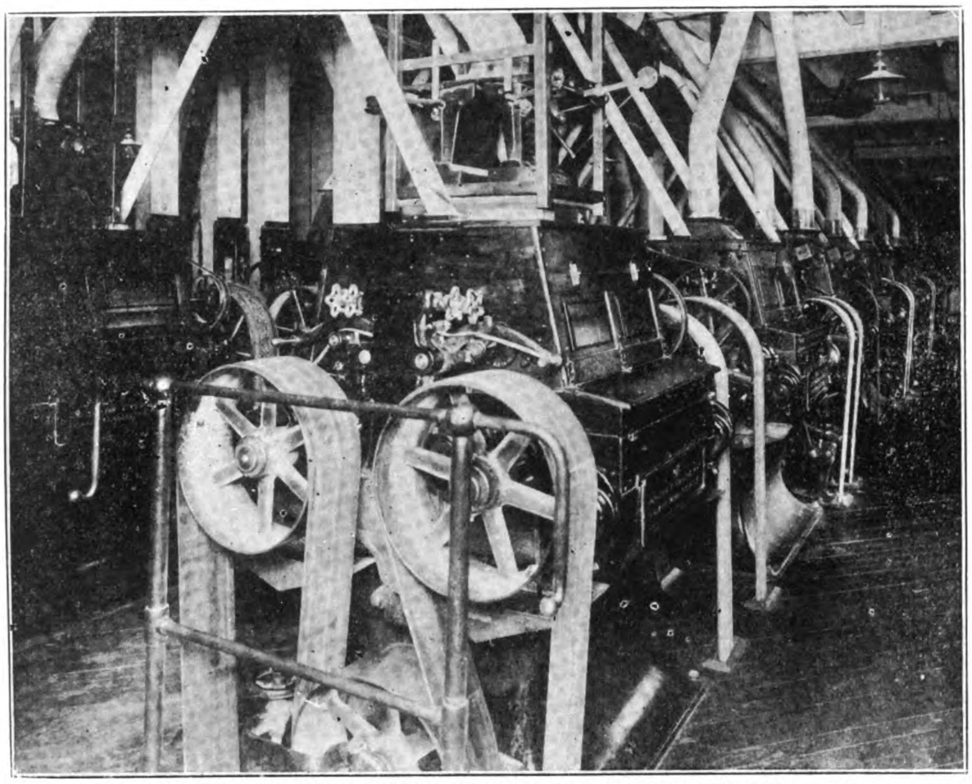
In November, 1921, American wheat was quoted at Y.6.00, while the C.I.F. price Yokohama was Y.6.20. The amount of Canadian wheat imported is the least, although Canadian wheat is the best quality the Japanese import. This was due to the fact that Canadian prices did not fall for some three months after Australian and American began to decline. The average purchase price of foreign wheat was Australian Y.5.50, and American and Canadian, Y.6.20 to Y.6.30, per 100 *kin*.

But the price of wheat suddenly recovered Y.2.00 per 100 *kin*, while the price of flour also rose by 50 sen a bag. Even with prices falling at the present time, they still remain about 30 sen higher than the lowest price reached last year. It is natural therefore that the future of the flour milling trade should not be considered so alarming.

The production of the mills was completely sold up to the end



Allis-Chalmer's Universal Bolter with Vibromotor Drive: Dairi Mill of the Nihon Flour Company

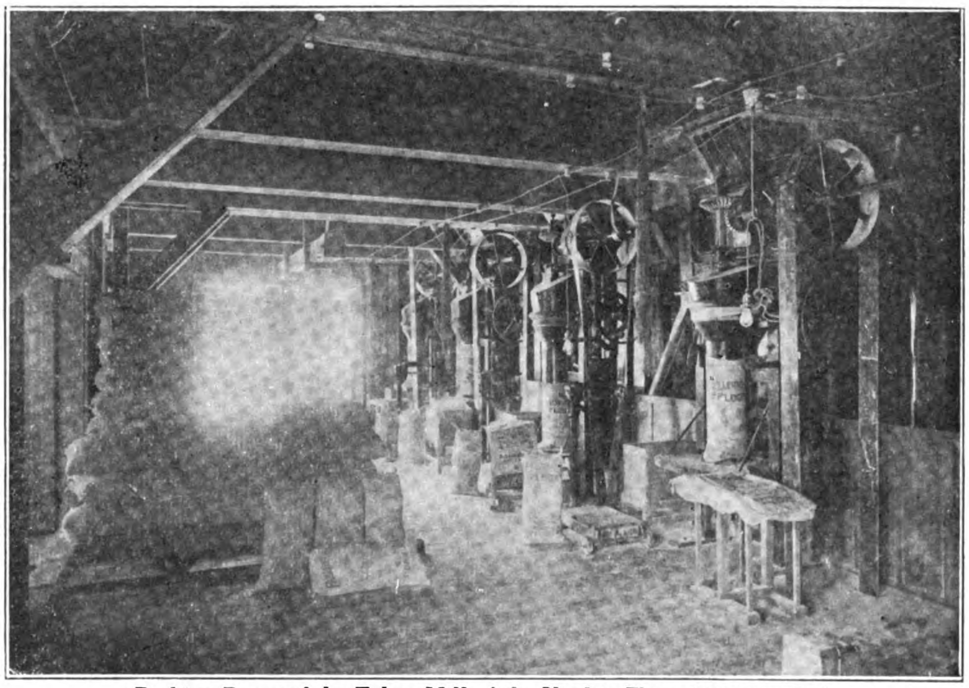


Allis-Chalmer's Roller Mills: Dairi Mill of the Nihon Flour Company

of March, 1922. The production will, therefore, not be thrown on the market for sale at any price. Consequently it does not seem that matters are in any very unfavorable state for the profits of the flour mills.

Cost of Production

Estimating the price of wheat C.I.F. Yokohama at Y.6.50 per 100 *kin*, when duty and certain minor costs are paid, it mounts to Y.7.50 per 100 *kin*. Estimating two bags of flour from 100 *kin* of wheat, the net cost of flour is Y.3.75 a bag.



Packing Room of the Tokyo Mill of the Nisshin Flour Company, Ltd.

The flour mills have been refusing sales at less than Y.3.80 a bag and with the exception of quantities dumped by the weaker concerns, there has been little flour for sale under the fixed price. Consequently the flour mills have been making a profit of 5 sen a bag. The recent improvement of prices has greatly increased this profit, and as millers who are not acting in the price agreement are also profiting by this advance. It may accordingly be believed that the business results of the flour mills this half year, December, 1921-May, 1922, will be quite satisfactory to the shareholders. Unfortunately there are some mills which bought foreign and domestic wheats at high prices. Those who bought the largest amount of foreign wheat when prices were at their lowest are making the biggest profits to-day.

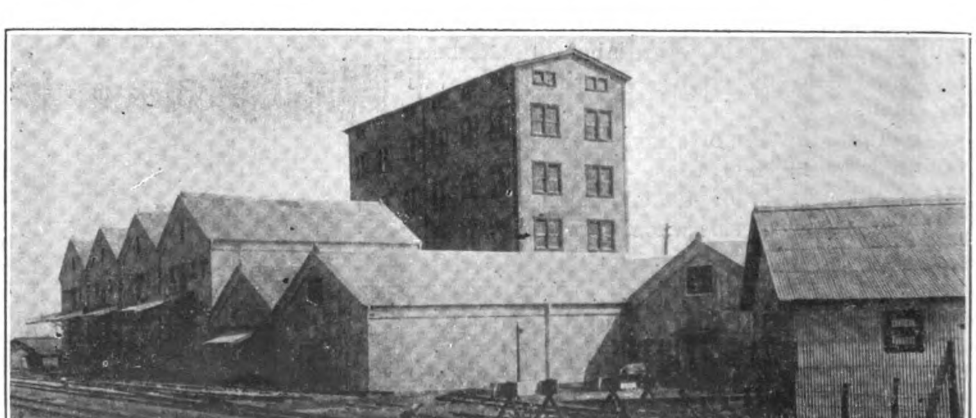
It is impossible to learn just what amount of wheat has been purchased by each company. But from all information available it would appear that the Toa Seifun K.K. bought the greatest amount, at least compared with its productive capacity, of any company in Japan, while comparatively, the Nisshin Seifun K.K. bought the least. But when the total amount of wheat purchased is considered the Nihon Seifun K.K. bought the most, and the Toa Seifun K.K. the least of the three big flour companies. Whether these companies will show good results this term remains to be seen, but the general tendency is to be hopeful.

After the outbreak of the war the flour milling companies were uniquely prosperous, but from the end of the first term of business in 1920 (May), things have been going from bad to worse. The three big companies at once adopted a policy of watchful waiting. They made no capital changes, and called up no new payments on issues outstanding. The Toa was the only company to increase its capacity, by 1,000 barrels, while the Nihon became somewhat more strong by some amalgamations of minor concerns. All the companies reduced production to the minimum of demand, and naturally their income shows great decreases.

The Three Big Companies

From the points of capital and productive capacity the greatest flour milling company in Japan is the Nihon Seifun K.K. Its capital authorized May 31, 1921, was Y.11,-550,000, of which Y.5,625,000 was paid up. On the same date it had loans unpaid amounting to Y.4,000,-000, and reserves of Y.2,710,000.

In the first half of 1920, ending May 31,

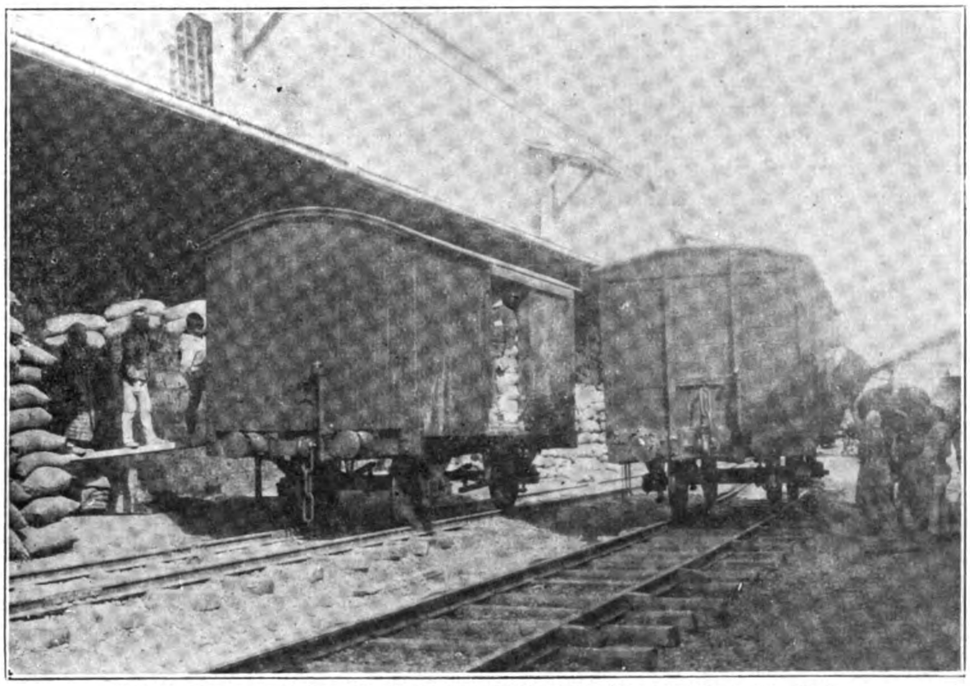


No. 2 Tokyo Mill of the Nisshin Flour Company

1920, it earned Y.2,056,000 about 50 per cent. of its paid-up capital. One year later during the first half of 1921, its profit was only Y.42,000, about two-tenths of one per cent. of its paid-up capital. This has been an ordinary matter for most companies which were paying 20 per cent. dividends the beginning of 1920 were passing them by the beginning of 1921.

The Nisshin Seifun K.K., on May 31, 1922, had an authorized capital of Y.4,500,000, of which Y.3,100,000 was paid up. It reported no loans unpaid, and had reserves of Y.1,578,500. This company shows little change between 1920 and 1921. On May 31, 1920, its profits were Y.1,174,000, a year later they were only Y.510,000. But this decrease is very slight compared to the results of the Nihon Seifun's business.

The Toa Seifun K.K. showed a great decrease in profits between the first term of 1920 and the first term of 1921. Its authorized capital, May 31, 1922, was Y.2,500,000, of which Y.1,250,000 was paid up. It reported no loans unpaid, and owned reserves amounting to Y.238,-523. But profits fell from Y.356,000, in 1920 to Y.122,000 in 1921.



Private Railway Siding to the Tokyo Mill of the Nisshin Flour Co., Ltd.

The total profits of these three companies at the end of the first term in 1920 was Y.3,-586,000, which declined by the end of May 31, 1921, to only Y.674,-000, or approximately one-fifth. The profit rate, figured on paid-up capital, decreased from 74.5 per cent. to 14 1/7 per cent.

At the same time the rate of dividend paid by the three companies decreased from an average of 24 per cent. to 9.3 per cent.

But the business results of all three companies showed improvements during the second half of 1921. Nihon Seifun profits reached Y.412,000, Nisshin profits were Y.613,000 and Toa profits, Y.182,000. This almost doubles the rate of profit and dividends increased to an average of 15 per cent. in the second half of 1921.

The Nisshin Seifun K.K. always retains 20 per cent. of profits as reserve. Consequently the percentage of its reserves, to its paid-up capital, is always much greater than that of the other companies.

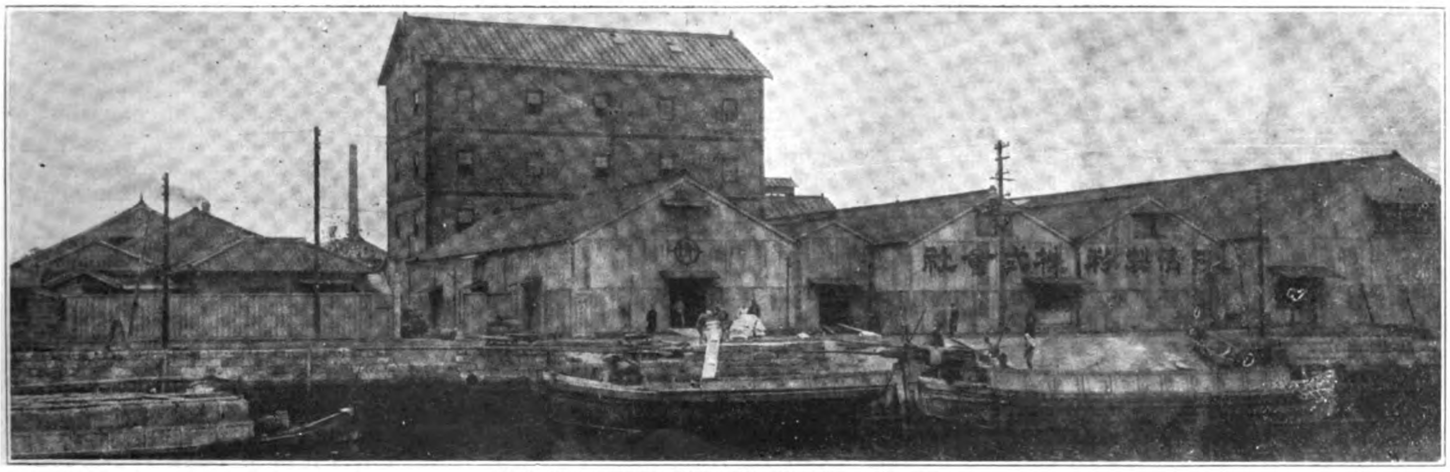
The fixed capital investments of these three companies per barrel of productive capacity are as follows :

	Fixed Capital	Productive Capacity	Fixed Capital per barrel
Nihon Seifun K.K. ..	Y.14,658,000	25,166 Bbls.	Y.5,824
Nisshin Seifun K.K. ..	7,639,000	14,961 ,,	5,039
Toa Seifun K.K.	3,131,540	10,505 ,,	2,981

To-day the principal factor affecting the profits of flour milling companies is their purchase of cheap raw material, and in their method of marketing their products. The Nisshin bought raw material in a cleaver manner thus increasing its profits. But the Nihon Seifun failed to purchase cheap Australian wheat, and consequently received a blow from which it has not yet recovered. This company resorted to the over-estimation of its real estate by Y.2,400,000 in its last term 1920, thus showing a fictitious profit. It has not yet recovered from this blow to its prestige in the financial market.

The profit-making ability of these three companies is as follows :

Company	Capacity barrels	Profit	Profit per barrel of Capacity
Nihon Seifun K.K. ..	6,900	Y.412,000	Y.5.97
Nisshin Seifun K.K. ..	5,700	613,000	10.75
Toa Seifun K.K.	3,000	182,000	60.65



Yokohama Mill of the Nisshin Flour Company

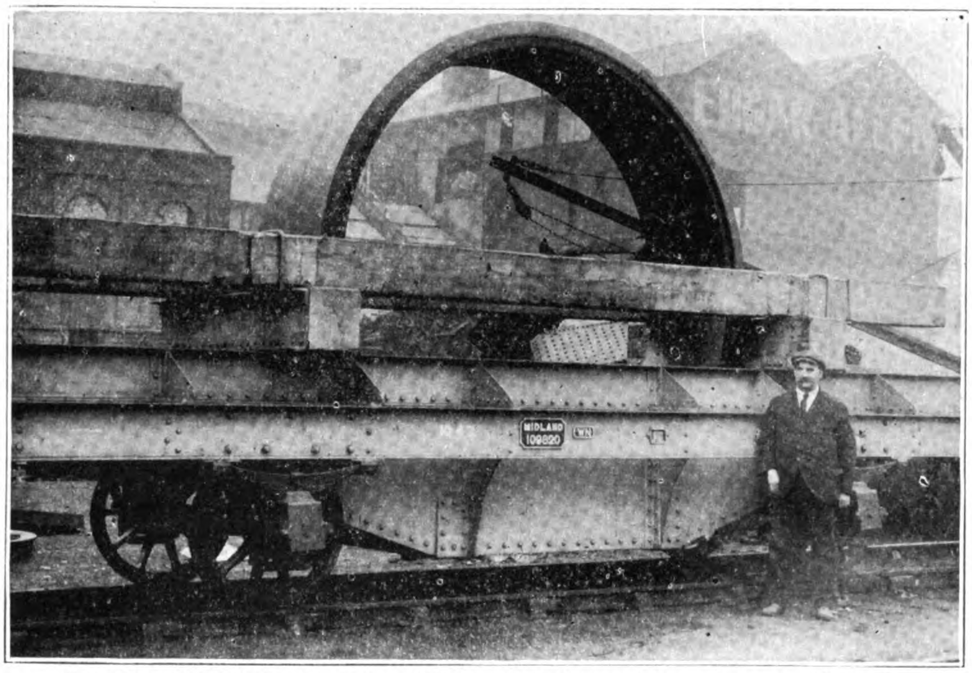
Steel Direct from Ore

Blast Furnace Eliminated from Steel Making

A Tribute to British Commercial Honor

THE production of steel direct from the ore has been the dream of metallurgists for years, and though many experiments, in a small way, have from time to time been made by eminent scientists, the problem, if not actually solved, has been at least allowed to remain in abeyance for all practical purposes, chiefly because it was found that any of the new processes were so costly as to make the production of steel by them an uneconomic proposition.

A few years back, however, it was mooted in metallurgical circles, that a French metallurgist, M. Basset, had at last discovered a method by which steel could be produced direct from the ore at a cost which would ensure commercial success. The Frenchman kept his secret well, and, though, at the time, there were many sceptical remarks on his claim to have succeeded where others had failed, none was quite sure of the lines upon which he had been working. Nothing had appeared in any of the technical journals, and, the debates at scientific societies either in Sheffield or in France were strangely silent on a matter, which, if all that is claimed for it is correct, promises to revolutionize the whole of the iron and steel industry of the world.



One of the Special Trucks designed to transport the special machinery made at the Edgar Allen Works, for a new process steel plant in France

The Dream of Years

A visitor to the railway sidings at the works of Messrs. Edgar Allen & Co., of Sheffield, last February would have found ample food for assuming that, whatever the sceptics may have had to say, the great French metallurgist is at least satisfied that he has brought the dreams of his fellow-scientists within the bounds of practicability. For there, on no less than twenty-nine trucks (fifteen of which were of a specially large size to receive their load) was securely packed, the first unit of a plant, which is going to attract the attention of the steel and metallurgical world.

It was a wonderful sight. Two of the most powerful engines of the Midland Railway Company stood hissing steam from their safety valves; behind them, on the quarter of a mile of trucks, lay a collection of the most unique and conglomerate mass of iron and steel that has ever been seen on the rails either in this or any other country. In Sheffield, there were a dozen or so cylindrical tubes, some measuring ten feet in diameter, and others measuring eleven feet eight inches, nestling snugly in their wooden beds and lashed down securely with great chains. They reminded one of the sections of a large funnel of an Atlantic liner. There, standing in a slanting position on ends, were large cast-steel riding rings, measuring 13-ft. 6-in. in diameter, and weighing 8 tons each. To have laid them on the flat meant exceeding the gauge limit and to have put them in an upright position would mean the sweeping away of bridges and tunnels perhaps. Behind them lay an assortment of weird and wonderful machinery all destined to play its part in the great invention.

Big Transport Problem

As the hooters of the surrounding works sounded the hour of one o'clock, the mighty mass of metal moved slowly off to the accompaniment of much puffing and snorting of steam by the locomotives which were severely tested in their efforts to get their cargo under way. It was estimated that in all there were some 1,000 tons of machinery on the move, 200 of which, represented the weight of the plant being shipped to Domicile, France. The operation was watched with the greatest anxiety by the directors, staff and workmen of the firm, who were naturally desirous that their latest product should not suffer any mishap at the outset of its journey. The difficult task of conveying the goods to their French destination was entrusted to the expert hands of Messrs. Henry Johnson Sons & Co., Norfolk Row, Sheffield.

For the transport of the machinery to Hull, the Midland Railway Company had to make special arrangements to ensure safety. From that port it was shipped by special steamer to Rouen, from whence it was taken by rail to Domicile. So fraught with danger is the transporting of the huge mass, that Messrs. Johnson's French representatives had to make special arrangements with the French railway authorities for its handling.

As stated, little is known of the actual details of M. Basset's process. So desirous was the inventor that as little as possible should be known of his work, and so great was his faith in Messrs. Edgar Allen & Co., that he stipulated there should be no sub-contracting. Therefore, the whole of the plant has been constructed at the famous Tinsley Works, and the section despatched last February only represents one-third of the whole order.

Tribute to Sheffield

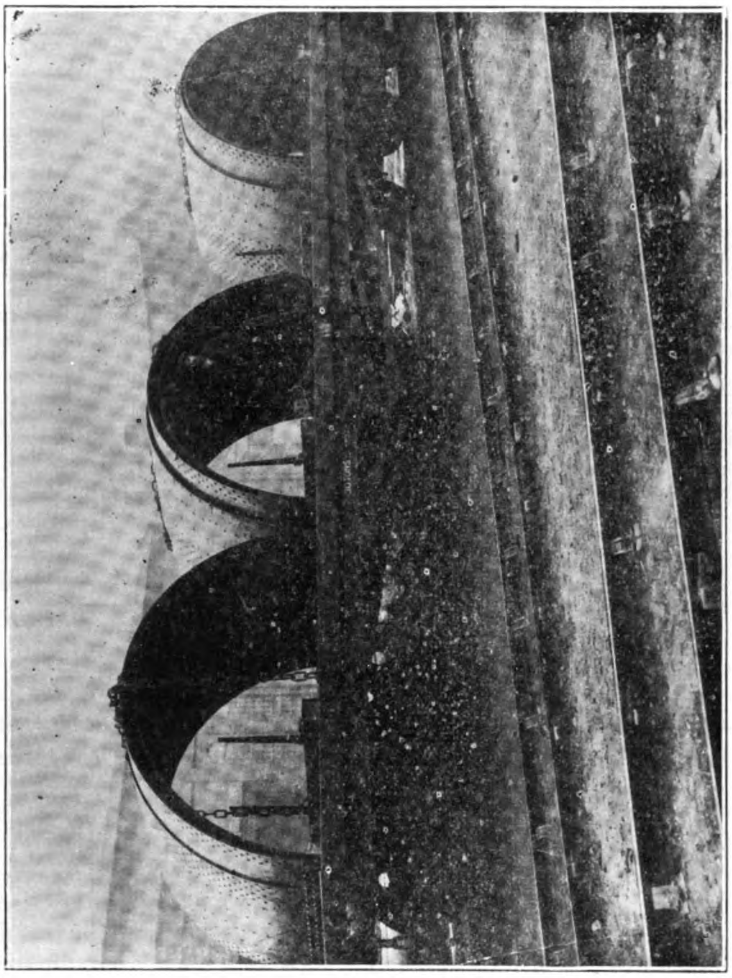
It is a tribute to the firm to say that their craftsmanship, and the discreet manner in which the inventor's wishes regarding secrecy were observed, have earned the whole-hearted approbation of M. Basset. Sheffield, the home of the steel trade of the world, was entrusted with the manufacturing of a plant which bids fair to revolutionize its staple industry, but Sheffield, outside Messrs. Edgar Allen's works, knew nothing of it! Such commercial integrity will redound to the everlasting credit of the firm and add yet another link to the city's reputation as a place where business men, either at home or abroad, can have a fair and square deal.

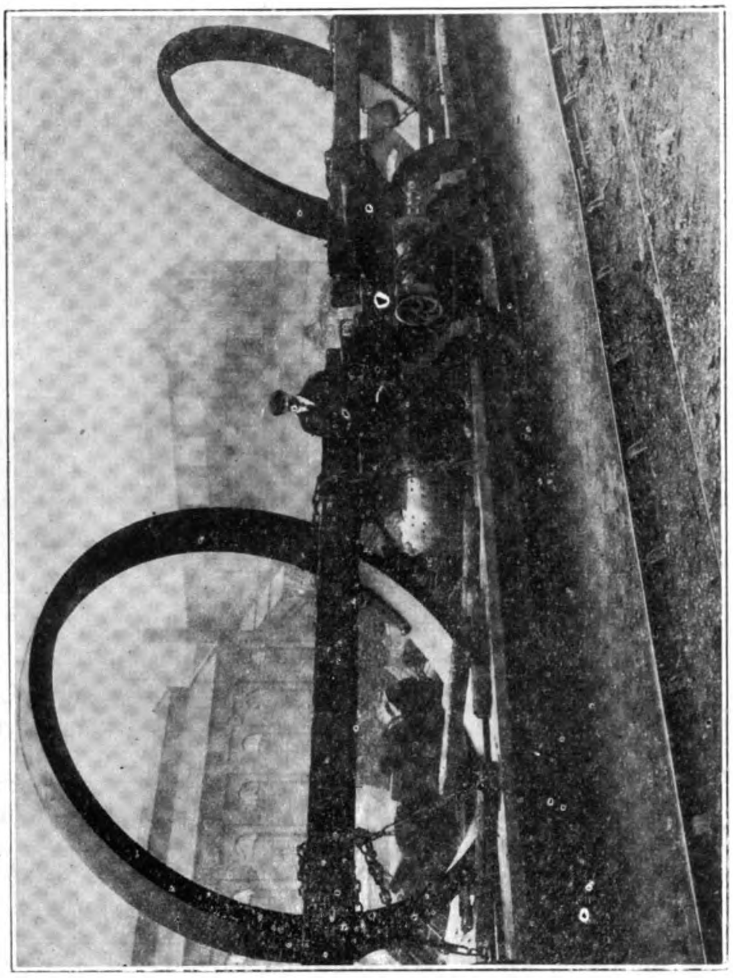
The basic principle of the Basset process is somewhat akin to the rotary kiln of a cement works. The use of the last furnace is entirely eliminated, and this, of course, is the important factor when the cost of producing steel is taken into consideration. Into revolving cylinders, some 200-ft. long, the ore

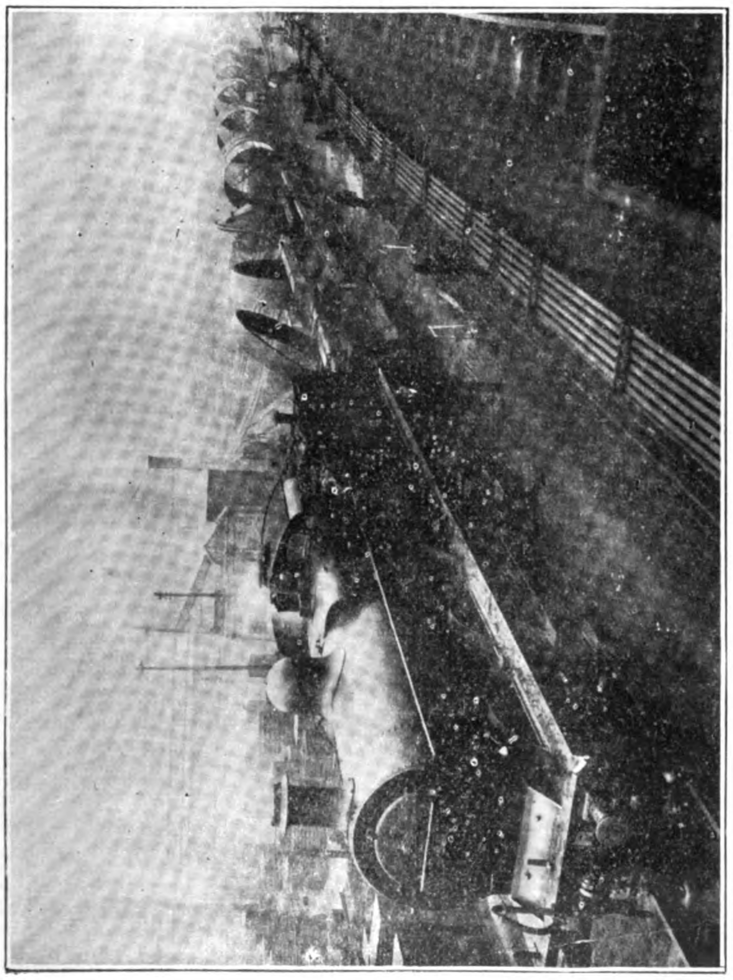
will be projected at one end, and, as it works its way towards the other it will be fired with pulverised coal, much in the same way as a rotary cement kiln. The cylinders will, of course, be lined with firebrick, and when revolving will weigh about 400 tons each. Such in brief is the method, the success or otherwise of which is keenly awaited by the whole metallurgical world.

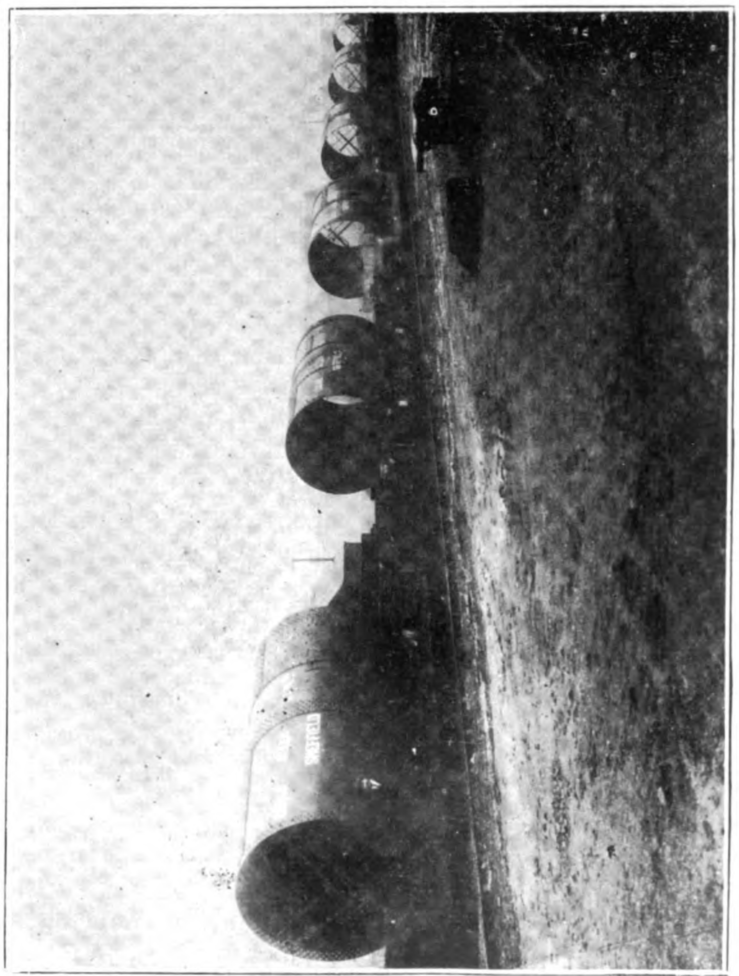
THE PLANT EXPECTED TO REVOLUTIONIZE STEEL MAKING

The first shipment of twenty-nine trucks of special machinery made at the works of Edgar Allen & Co., of Sheffield, for erection in France, where the manufacture of steel will be attempted without the use of blast furnace

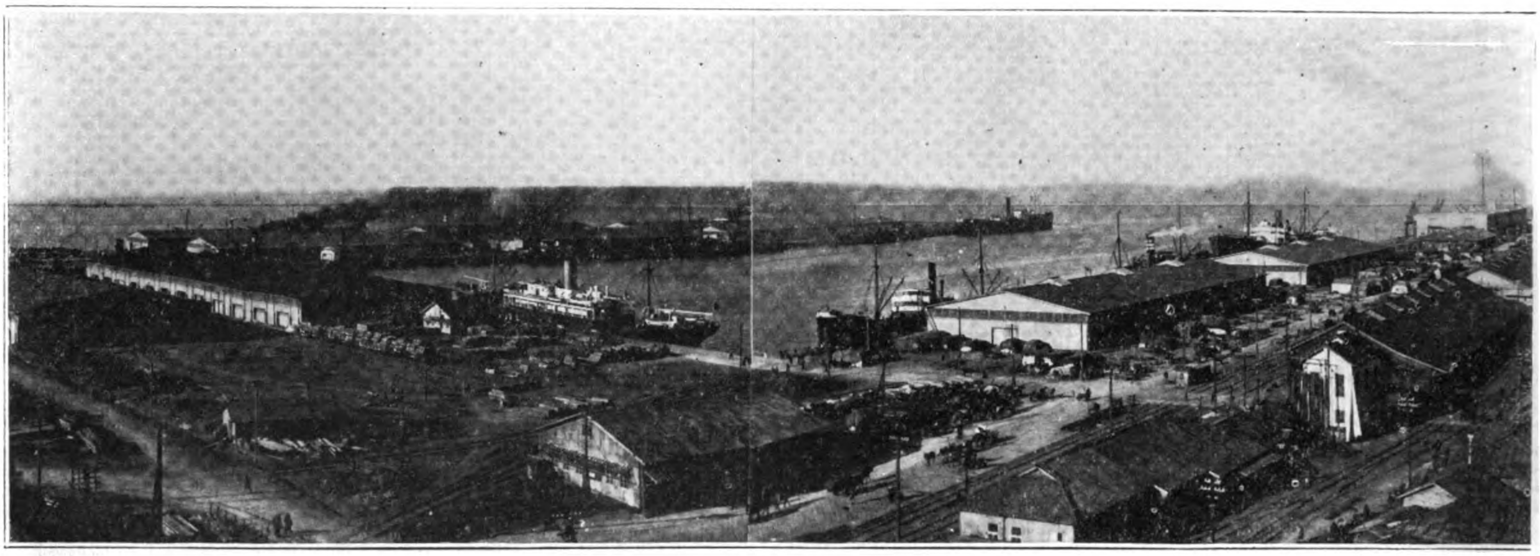








DAIREN



PANORAMA OF

THE rise of Dairen to the second port of China is one of the marvels of Far Eastern development, an indication of what can be done in other parts of China under an efficient and honest government. Twenty years ago it was a mud hovel fishing village, to-day, the gateway to one of the richest empires of the world, the land of to-morrow. The grand plans of Russia for the development of this port have been carried out and magnified many times by the South Manchuria Railway Company, whose development of the soya bean and the coal of Fushun provides freight for the railway and cargoes for the fleets of steamers that now enter and clear from the port. Dairen is the outlet and inlet, the commercial metropolis of the vast region that in the next quarter century will loom large in the pages of history.

The port works are being constantly improved to handle the increasing volume of trade. New concrete warehouses with special cargo-working appliances are taking the place of the old open-storage system, a beautiful modern fireproof office building houses all the different harbor offices, and special equipment of all kinds has been installed to take care of the many different requirements of loading and unloading vessels. The port of Dairen is up-to-date, the best equipped in China. Some idea of the advances that have been made in the port under Japanese direction may be gleaned from the following official figures :—

Port of Dairen.—The port of Dairen is the starting point of the South Manchuria Railway and a gateway to Manchuria and Mongolia, the staple products of which find the only outlet open all the year round. It is also the only free port in the Far East.

Dalny under Russia.—Russia, eager to secure an ice-free port in the Far East, leased for the term of 99 years the so-called Kwantung leased territory, in the southern extremity of Liaotung peninsula, by virtue of the Russo-Chinese treaty in 1898.

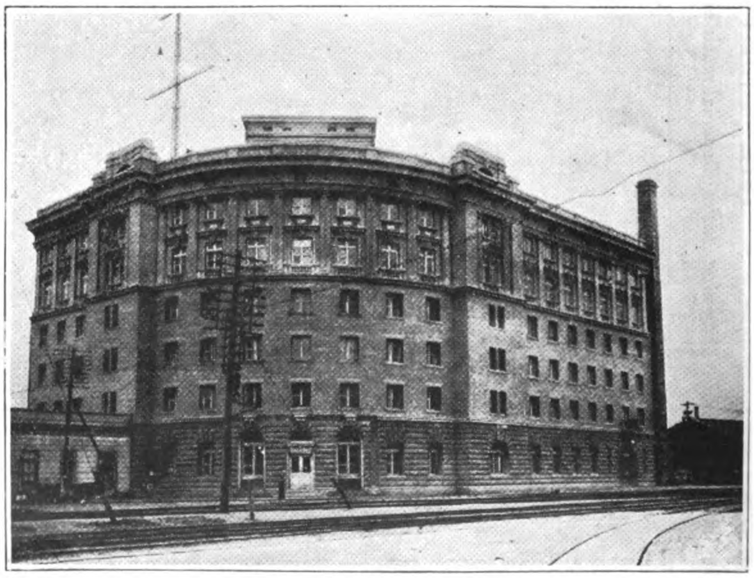
Russia started immediately afterwards to construct a commercial port on an extensive scale, which was then styled Dalny meaning "Far Away" in Russian, and which has been destined to grow up into the present port of Dairen.

Under Japanese Management.—In September, 1905, in terms of the Portsmouth treaty, Japan took over the leasehold above mentioned and established the South Manchuria Railway Company with the object of improving the economical situation of Manchuria work of reconstruction, extension and fresh construction has been energetically carried on at an enormous outlay and the port of Dairen has become what it is to-day.

Dairen can now accommodate vessels to the extent of 150,000 tons at a time. The aggregate annual exports and imports reached 4,500,000 tons.

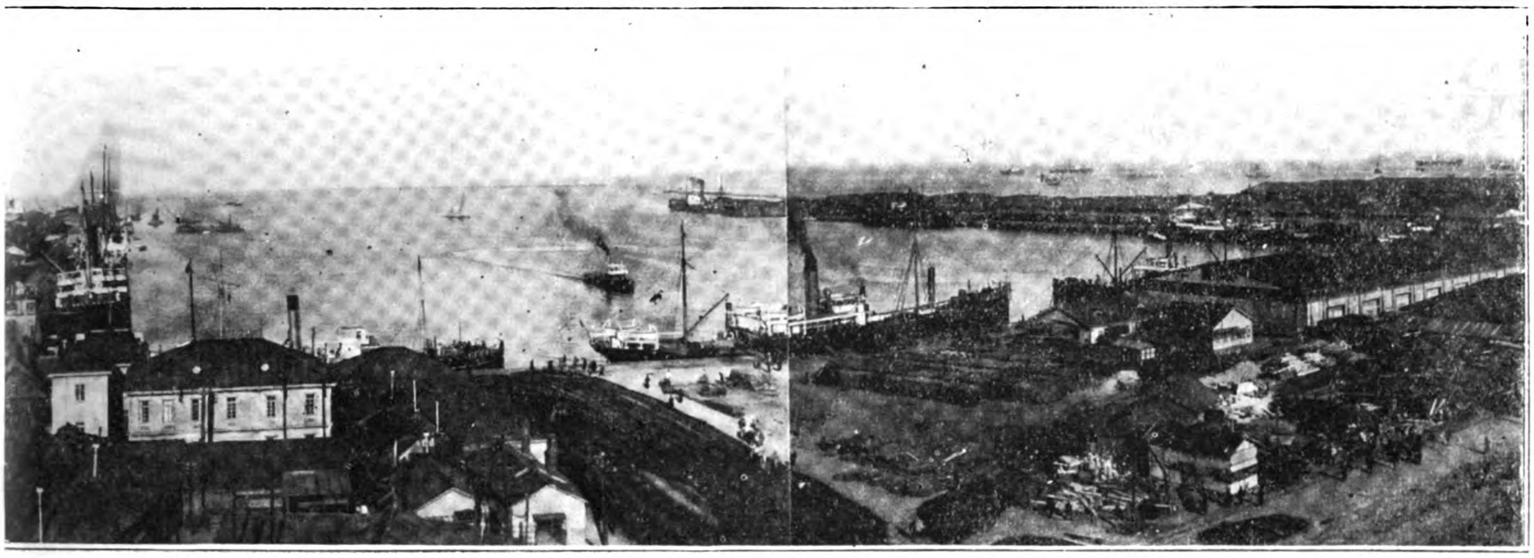
Free Trade Zone.—By the provisions of the Russo-Chinese treaty, the Kwantung leased territory remains a free trade zone.

Cargo-work.—Cargo-work at Dairen is in principle conducted along the quay wall. When no berth is left available, cargo-work may be done by lighters. As more or less difficulty attends on the berthing and unberthing of vessels, the compulsory pilotage system is instituted and operated over vessels of over 1,000 tons gross. The pilotage need not, however, be borne by the vessel. Nor is any wharfage charged. Only, as fee for the use of steam launches, etc., at the time of berthing and unberthing, a tariff of charges for the same is charged. In this respect, Dairen finds not alike among the ports in the Far East. It may be considered as a substantial favor to the vessels calling at Dairen.



New Wharf Office at Dairen

HARBOR



DAIREN HARBOR

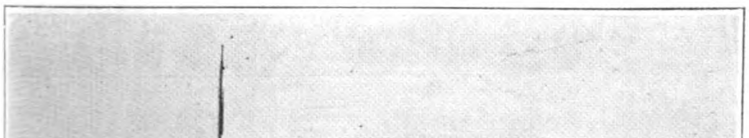
Cargo-working Equipments.—No special equipments worth mentioning exist at present in the line of cargo-working facility. Coolie labor is depended upon almost wholly. In efficiency, however, coolie labor quite holds its own against mechanical working. Besides, because of its cheapness, the low rates obtaining at Dairen in cargo-work and other charges have no parallels elsewhere in the world.

Chinese Coolies.—Chinese coolies are generally of mild disposition and well suited to employment in a gang. Shantung is the principal source of supply of coolie labor.

The exports of Dairen consisting mainly of agricultural products there are distinctly busy and dull seasons. The busiest season begins about the middle of November each year and lasts till about the middle of the following March. In summer, things usually move slowly, and it is often called the dull summer spell.

A tendency has appeared lately to bring both extremities nearer together.

Climate.—The climate may well be called a continental one. It is intensely cold during the busy season, and more or less difficulty is met in cargo-work at times. But never has the surface of water in the harbor got frozen so badly as to make it impossible for a vessel to come to, or leave the wharves. So far the thickest ice formed in the harbor was about 10 inches. However, as the service of ice-cutters is always available, no hindrance has been felt to the access of shipping. It may be added that the larger-typed launches belonging to the wharf office are all equipped with ice-breaking appliances.



Entrance to Dairen Harbor: Light House at end of Breakwater

Wind.—There is a strong north wind prevailing in winter, but no serious difficulty is experienced. In other seasons, there is no local wind.

Current.—No current runs in the harbor of Dairen, and this facilitates ship's access.

Fog.—It is foggy about the months of May, June and July, and the fog is often a menace to the shipping. There is, however, a foghorn installed on South Sanshantao Island at the entrance to the Dairen harbor. The foghorn is audible at the distance of 10 miles outward. Besides, a light-house showing a white revolving light stands on the same island. The light is visible 21 nautical miles off in clear day.

Wireless Station.—The Dairen bay wireless station is situated at Shatozu Takushan, about 11 miles eastward.

Wireless messages are accepted at the Dairen post office.

Harbor Administration and Management.—The harbor administration is attended to by the marine bureau of the Kwantung government. The maintenance, reconstruction and repair, extension, etc., of the harbor and its accessories are all looked after by the South Manchuria Railway Company. The management of the Dairen wharves belongs to the wharf office.

Wharf Office.—The wharf office is divided into the four offices of secretary's, shipping, goods and yard, and employs about 1,700 officials and employees.

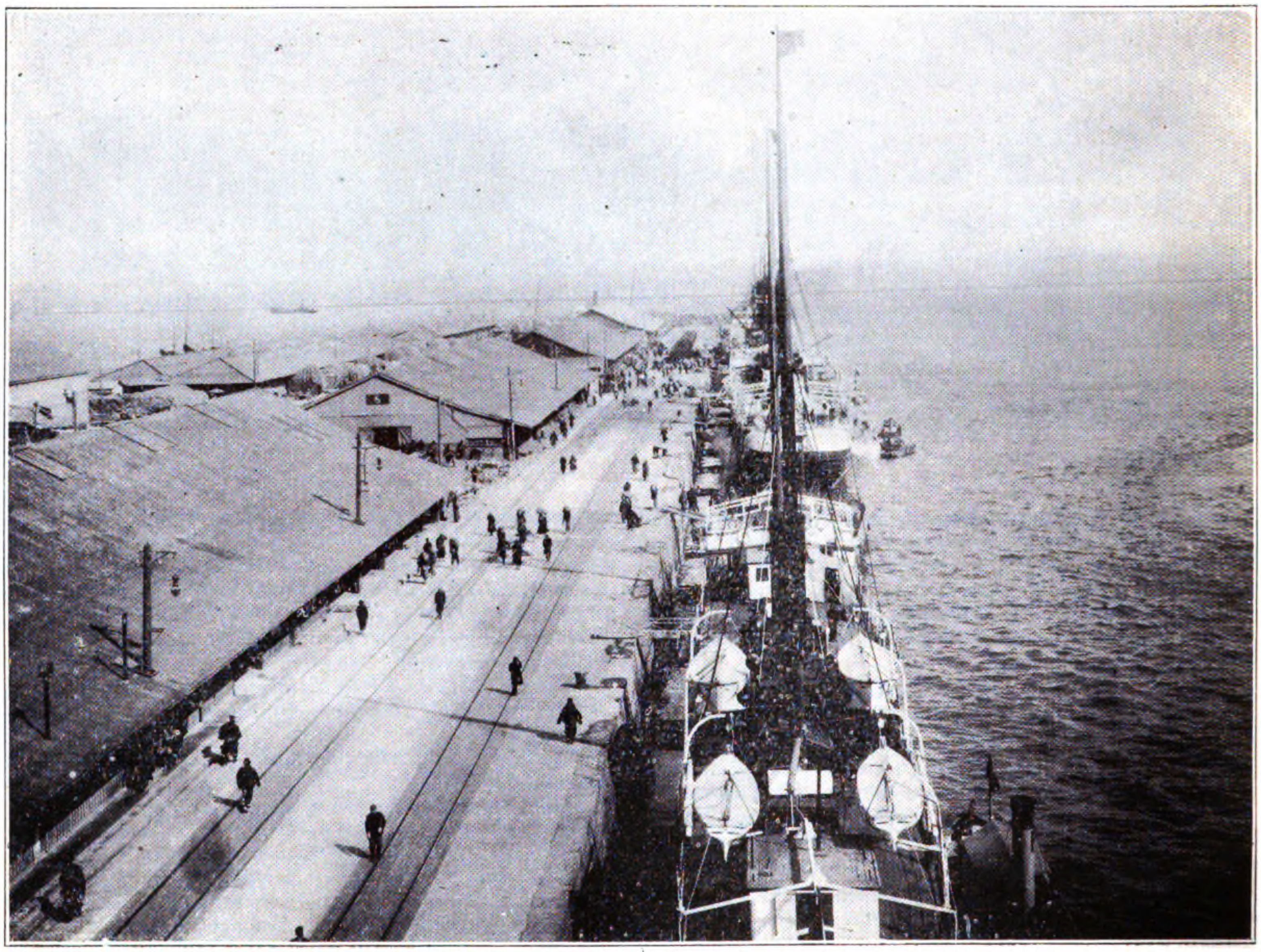
The principal businesses of the wharf office are cargo-work, terminal loading and unloading of railway goods, and warehousing. Sundry services appertaining to these businesses are also conducted.

Goods in storage (under custody, on application) are covered by fire insurance without the owners' expense.

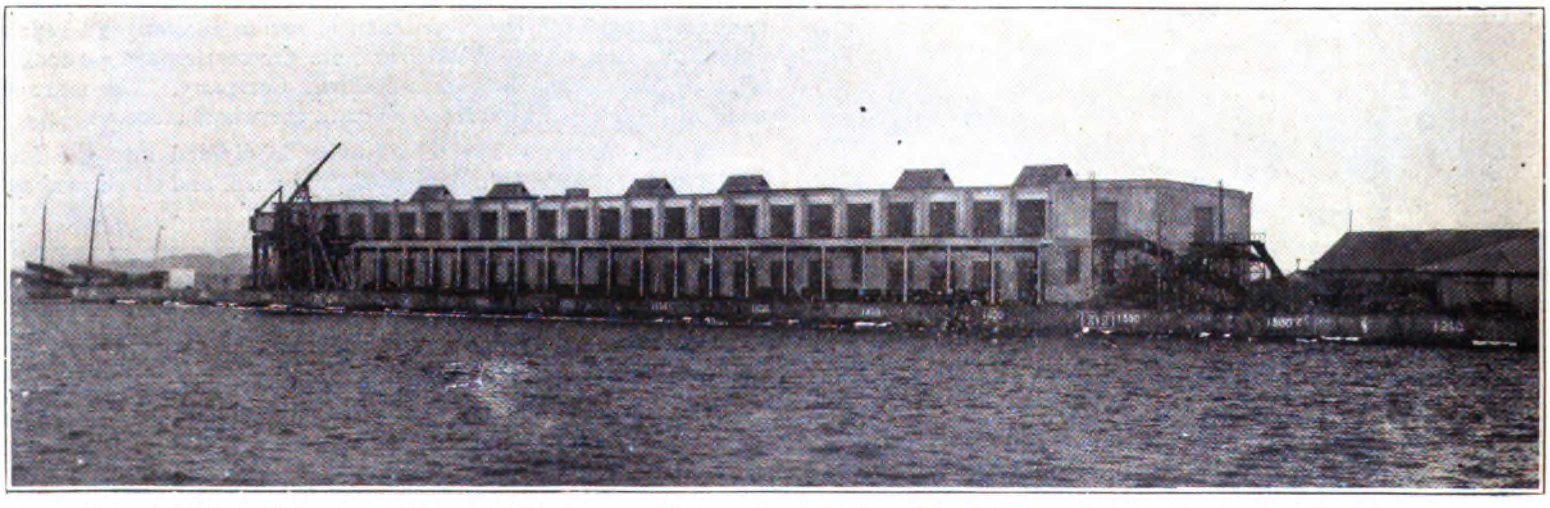
The different schedules of charges are as follow :

1. Baggage and freight tariff.
   Warehousing charges.
2. Regulations concerning cargoes and vessels.
3. Specific charges on the wharves.

THE BEAUTIFUL HARBOR OF DAIREN



Mail Steamers at the Dairen Wharves



One of the Several Permanent Concrete Wharves and Warehouses of the New Wharf System of Dairen Harbor for the Storage and Handling of the Immense Soya Bean Shipments which pass through the Port

EXTRACTS FROM STATISTICS :

	Vessels berthed. (Gross tonnage)	Exports & Imports. (Short ton)	Railway Goods Arrived & Despatched (Short ton)
1911 ..	2,662,943 tons.	1,407,761 tons.	1,195,271 tons.
1912 ..	2,872,122 ,,	1,557,320 ,,	1,427,169 ,,
1913 ..	3,556,250 ,,	2,105,985 ,,	1,995,385 ,,
1914 ..	3,838,078 ,,	2,104,590 ,,	1,976,951 ,,
1915 ..	3,461,530 ,,	2,270,036 ,,	2,203,777 ,,
1916 ..	3,095,257 ,,	2,331,446 ,,	2,308,781 ,,
1917 ..	3,118,715 ,,	2,988,856 ,,	2,662,517 ,,
1918 ..	3,473,397 ,,	3,447,699 ,,	3,092,468 ,,
1919 ..	4,380,920 ,,	4,223,775 ,,	3,554,613 ,,
1920 ..	4,864,904 ,,	4,038,851 ,,	3,834,899 ,,

BREAKWATERS : East Breakwater .. .. .. 1,221-ft.
North ,, ... 7,400 ,,
West ,, ... 4,500 ,,

Total .. .. 13,121 ,,

ENTRANCES : East entrance (main) 1,200-ft. in width.
North ,, (for sailing ships and steam launches.) 400-ft. in width.
West ,, (,, ,,) 200 ,, ,, ,,

WATER AREA : Inside breakwaters, 3,135,000 square metres.
(actually available about 3,036,000 s.m.)

BERTHING QUAY LINE :

	Length.		Length.	Total.
First wharf	2,525-ft.	Wharf "A"	1,225-ft.	13,450-ft.
Second ,,	4,400 ,,	,, "B"	900 ,,	
Third ,,	4,400 ,,			

BERTHING SECTIONS : 34 each, being 400-ft. in length.

INFLAMMABLE GOODS PIER : 1,135-ft. in length.

DEPTH IN BASIN : 30-ft. L.O.S.T. (low water ordinary spring tide.) Difference between high & low water, 8-ft.

STEAM LAUNCHES (for berthing & towing purposes) : 14 in number.
Largest, 224 tons gross.
Smallest, 11 ,, ,,

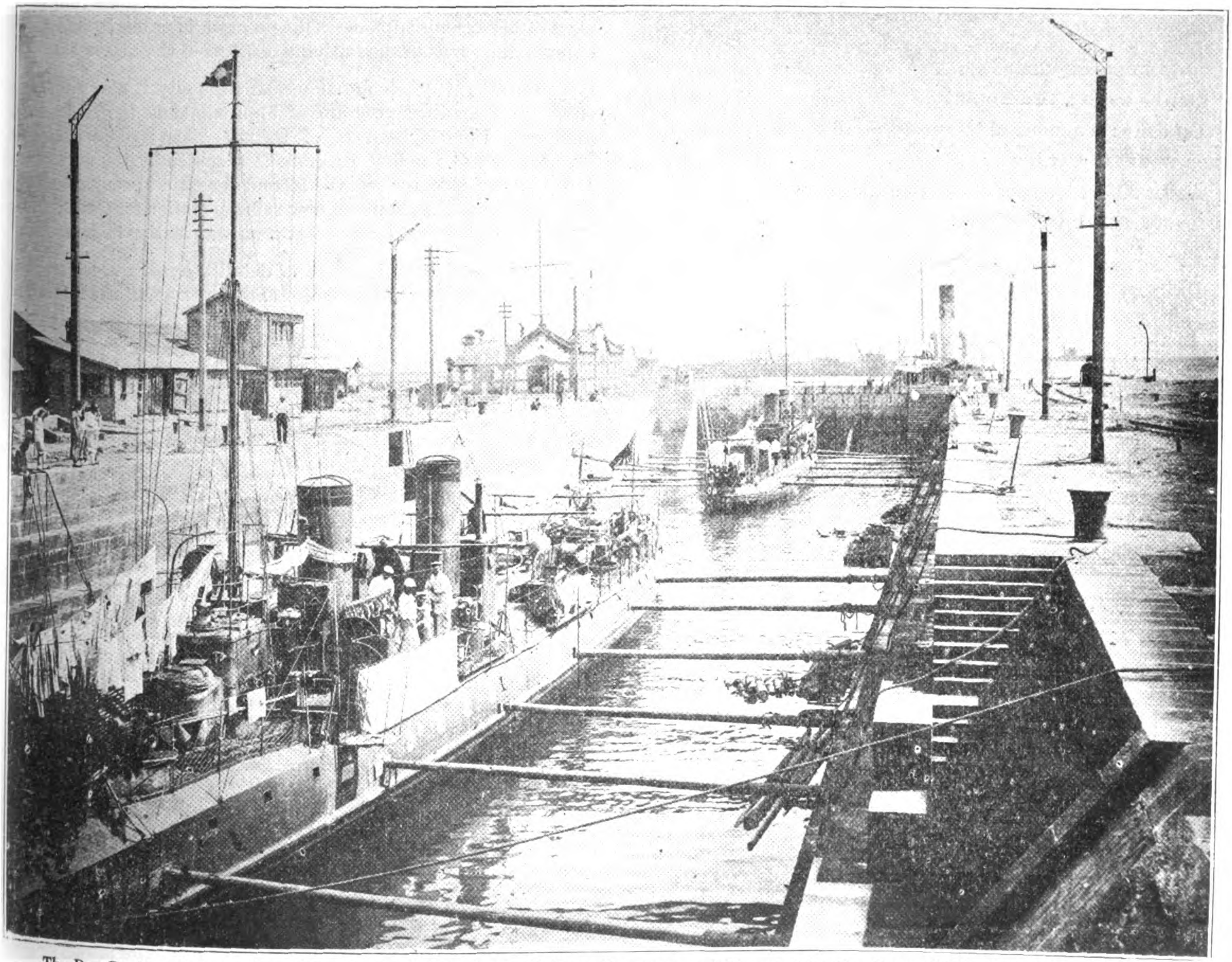
LIGHTERS (built of steel) :
12 in number.
Capacity .. {250 tons, 5 in number. / 100 ,, 7 ,, ,,}

SHORE INSTALLATIONS. (Wharf compound being about 1,485,000 square metres).

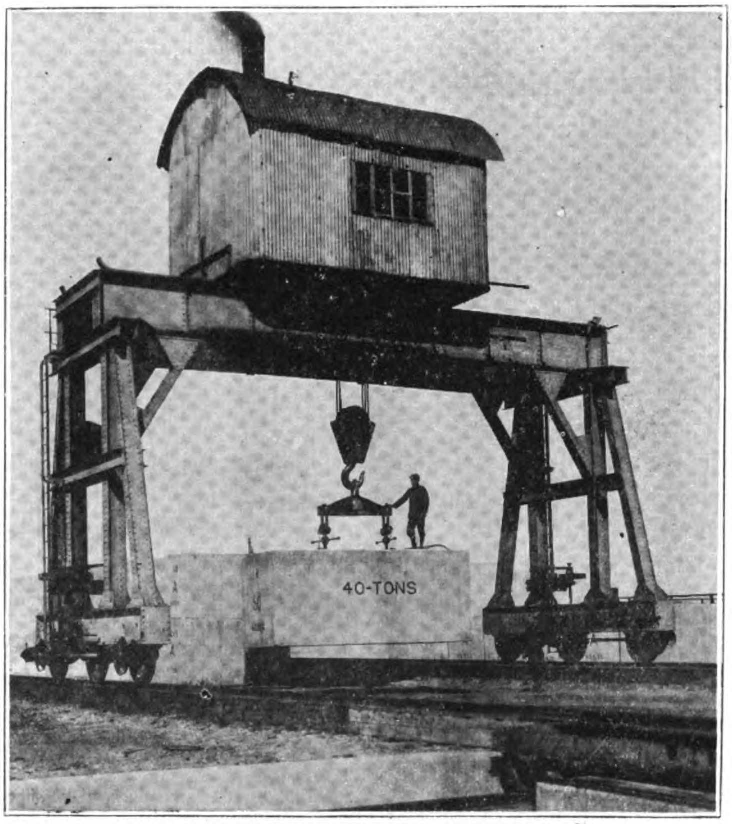
WATER SUPPLY : Hydrant for each berthing section, capable of supplying about 60 tons per hour.

WATER BOATS : Two, each capable of supplying 30 to 50 tons per hour.

COALING EQUIPMENTS : Sections 1, 2 and 3 are set aside for coaling. Bunkers can be supplied direct from coal cars. Lighters also available.
(Coal yard on the coaling sections can store about 80,000 tons.)



The Dry Dock at Dairen, Owned by the South Manchuria Railway Company and Operated by the Kawasaki Dockyard Company, Ltd. Only Dry Dock in North China Capable of Admitting Ships up to 6,000 tons



Dairen Harbor Works: Gantry Crane Transporting a 40 ton Concrete Block

CARGO-WORKING EQUIPMENTS :

On the water ; two 50-ton and three 25-ton floating cranes.

On shore : a number of $1\frac{1}{2}$-ton, 3-ton, 15-ton and 25-ton cranes.

CARGO-WORKING CAPACITY :

About 20,000 tons per day (10 working hours).

WAREHOUSES AND GOODS SHEDS :

	Number	Storage area.
Ordinary warehouses ..	57	246,444 square metres
Inflammable goods warehouses	9	7,227 ,,
Temperate warehouses ..	1	792 ,,
Bean oil tanks	5	each holding 120 tons.
Goods sheds	3	4,224 square metres
Total ..		258,687 square metres

OPEN-STORAGE GROUNDS : About 330,000 square metres.

MAXIMUM STORAGE CAPACITY OF WHARF COMPOUND : About 750,000 tons.

Highest storage record, about 600,000 tons.

SHIFTING EQUIPMENTS : Total length of shifting sidings, 45 miles.

Locomotive engines	12
Goods cars (30 tons each)	250
Motor trucks (4 tons each)	4
Trailers (2 tons each) .. .. (accessory to above)	8
Trucks (2 tons each)	6
Tractors..	2
Trailers (1 ton each) .. .. (accessory to above).	10

Carts, wheel-barrows, etc., are also used.

Daily shifting capacity (10 hours) about 20,000 tons.

CARGO WORKERS :

Chinese Coolies.

Average daily workers ; about 6,000-8,000.

per capita working capacity ; about 5 tons.

Contract suppliers : Fukusho Co. (sole contractor) They have coolies' quarters accommodating about 13,000 coolies.

DRY DOCK : One (under management of Kawasaki Dockyard Co., Ltd., and owned by S. M. R. Co.)

Docking capacity .. .. .. 6,000 tons gross.

Osaka's Road Program

The city of Osaka will soon begin an extensive road building program which will extend over a period of ten years and more than 40 million yen will be spent if the plans as proposed by the Osaka city planning commission are accepted and passed by the home department of the national government.

Under the plans as put forward by the city authorities ten main highways radiating from Osaka will be thoroughly made over. The new highways will be of macadam. This investigation has been going on for the last several months with Mayor Ikegami taking a leading part. He is chairman of the city commission. The plans also state that the new roads will be from 48 to 72-ft. in width, this depending upon the amount of traffic which will have to be accommodated. This program is primarily intended to improve the roads in the outlying districts of the city.

According to their announcement the city is also planning to enter upon another program of approximately the same size in rebuilding the city streets of Osaka. This is dependent upon whether or not the first program is accepted by the government. It is planned to carry out the second program in conjunction with the building of the proposed new railway station for Osaka. If the station is built it will be the largest railway station in Japan.

The following table shows in detail the roads which are to be improved under the first program and the expenditures for each :—

Lines	Approximate length in ken	Expenditures
Denpo-Amagasaki-Osaka ..	1,932	Y.7,159,087
Osaka-Itami	1,921	1,224,604
Osaka-Ikeda	4,519	8,741,588
Fuita-Osaka	4,009	2,083,258
Sumiyoshi-Osaka	1,551	1,254,501
Osaka-Maioka	1,573	2,275,398
Osaka-Nara	2,419	1,324,955
Tennoji-Kuroe-Osaka ..	3,385	2,559,967
National Road No. 2 ..	2,690	2,083,258
National Road No. 16 ..	3,377	5,927,637

New Typewriter Manufacturing Co.

On March 31, 1922, the Toyo Typewriter Kabushiki Kaisha, with a capital of Y.1,000,000, was organized in Tokyo, to manufacture typewriters in Japan to supply the demand for foreign language keyboards. One-fourth of the capital is already paid-up.

Electrical Developments in Japan

1. Diado Electric Power Co., Ltd.

IN February, 1921, the Osaka Soden Kabushiki Kaisha, the Nihon Suiryoku Denki Kabushiki Kaisha and the Kiso Denki Kogyo Kabushiki Kaisha, completed an amalgamation of interests, and organized the Daido Denryoku Kabushiki Kaisha to take over their properties and business, with a capital of Y.100,000,000. To-day, the outstanding paid-up capital of this company is Y.44,320,000. As the amalgamation is composed of three different companies, the paid-up shares issued are of different valuations ; one issue of 372,000 shares being paid up to the amount of Y.30.00 on a Y.50.00 face value, another issue of 120,000 shares is paid up to the value of Y.25.00, and the balance of the shares, 1,508,000, are paid up to Y.20.00. At the end of 1921 the company had outstanding Y.10,000,000 of debentures, besides ordinary loans amounting to Y.6,152,728.

The Daido Denryoku K.K. has under construction, or planned for early construction, some eight power plants which will generate 217,000 kilowatts in all. These plants are situated on the Kiso and Yasaku rivers. The entire construction program is to be completed by the end of December, 1925.

A detailed list of the power houses to be built follows :

(1) Kisuhara power house, in the Yasaku River, 6,000 kilowatts, began operations on February 18, 1922.

(2) The Okuwa power house, on the Kiso River, 11,000 kilowatts, will be completed in August this year. The whole generating capacity of this plant is under contract to the Kansai Denki K.K.

(3) Suhara power plant, on the Kiso River, 19,150 kilowatts, is now under construction. When completed this station will transmit its power to Osaka, together with the power generated at the Okuwa station.

When the plan to use the power generated in Stations 2 and 3 is put into operation it will cause a scarcity of power in the Nagoya district. This scarcity will be met by new power houses under construction, and from the Yasaku River plants.

(4) Shizumo power plant, on the Kiso River, 12,600 kilowatts now supplies Nagoya with its whole capacity.

(5) Nishikachihara power plant, on the Kuzuryo River, 7,200 kilowatts, supplies 2,000 kilowatts during the day, and 600 kilowatts at night to the Echizen Denki K.K., the Kyoto Dento K.K. and the Taisho Denki K.K. The balance of the power is used to manufacture caustic soda at the Takeu Factory.

(6) Kema power plant, coal burning. 12,500 kilowatts, now under construction and will be completed this year.

(7) Dokusho power plant, coal burning, 40,000 kilowatts, now under construction.

(8) Oi power plant, coal burning, 30,000, now being planned.

The company also contemplates erecting power plants on the Kiso River at, (1) Momoyama, (2) Ochiai, (3) Kasagi, (4) Nishikitsu and (5) Imawatari. There are also three coal burning plants in contemplation, at Hanabusa, Higashi Kachihara and Shitauchinami.

TRANSMISSION LINES :

(1) Sixteen miles between the Okuwa power plant, and the Nakatsugawa transmission station have been completed.

(2) Between Kiyosu transmission station and the Osaka transformer station, the line is now being erected.

(3) Between the Kiyosu transmission station and the Dokusho power plant, a survey is now being undertaken.

(4) Between the Kiyosu transmission station and the Osaka transformer station preparation is now being made to erect a line for telephone service.

The company now owns completed transmission lines for telephone service, between

(1) Shizumo power plant, and Rokugo transformer station.
(2) Kushihara power plant, and Mizunami transmission station.
3. Kushihara power plant and Mizunama transformer station.
The entire stretch of wires is 97.47 miles, of special high-pressure lines.

TO INSTAL RADIO TELEPHONE SYSTEM :

In addition to the above installations the Daido Electric Power Company is erecting the first radio telephone system in Japan between Osaka and the Kiso district, opening communication for 150 miles. It is to be for the use of the company, although it will be thrown open to the public in due time. Okuwa, in Kiso, on the Central Japan railway line, will be the starting point of the wireless line and a link of wireless communications will be established connecting Nagoya and Osaka.

The application has already been filed, and, as soon as permission has been granted, the work will be commenced. According to the plans and specifications the machine used will be the De Forest system of wireless telegraphy and telephony, form O T 401. The height of the poles will be about 150-ft., the power is 2 kilowatts and 1,800 volts. The starting point in Okuwa-mura, Nagano prefecture, is to be located in the generating station of the company, the receiving station in Nagoya is to be located in the branch office premises in Shichiken-machi, Nagoya city, and in Osaka in the transformation station at Furukawa Bashi, which station will be completed shortly.

While, at present, the distance to be covered is 150 miles, if the result be successful, a receiving station will be established in Tokyo and public service may be commenced in due time.

BUSINESS RESULTS :

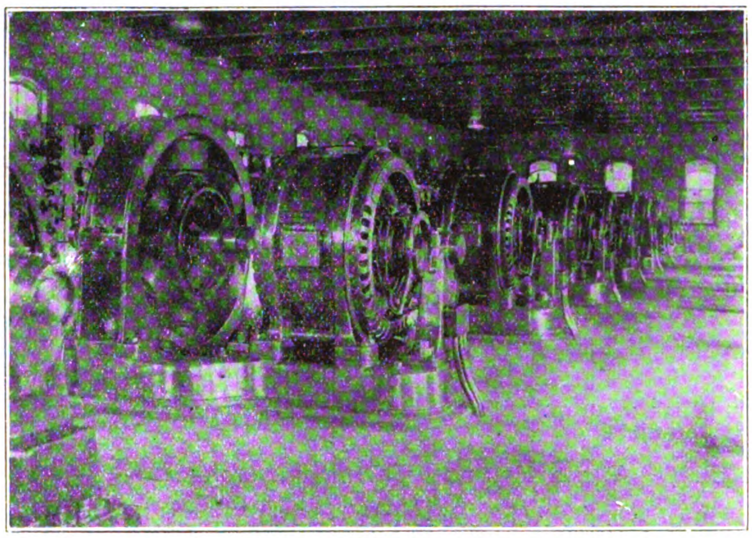
Last year the Daido Denryoku K.K. made profits of Y.856,260, to which was added Y.72,000 surplus carried over from the term before. Out of the total amount of Y.928,000 available to be treated as profits, Y.43,000 was taken for legal reserve, Y.50,000 for bonus for officials and Y.825,250 was paid in dividends at the rate of 6 per cent. per year, and only a little more than Y.10,000 was carried as surplus to the present term of business.

The company's officials report that it is increasing its income this term by some Y.500,000. Income from power sold is estimated at Y.1,616,000 while interest and profits on securities held will yield another Y.200,000. Miscellaneous income is estimated at Y.90,000, making the grand total of income for the present term, about Y.1,906,000. Something like Y.130,000 must be deducted from this amount for costs of operating power plants, Y.70,000 for taxes, and other expenses Y.505,000. The total expense for this term to be about Y.705,000.

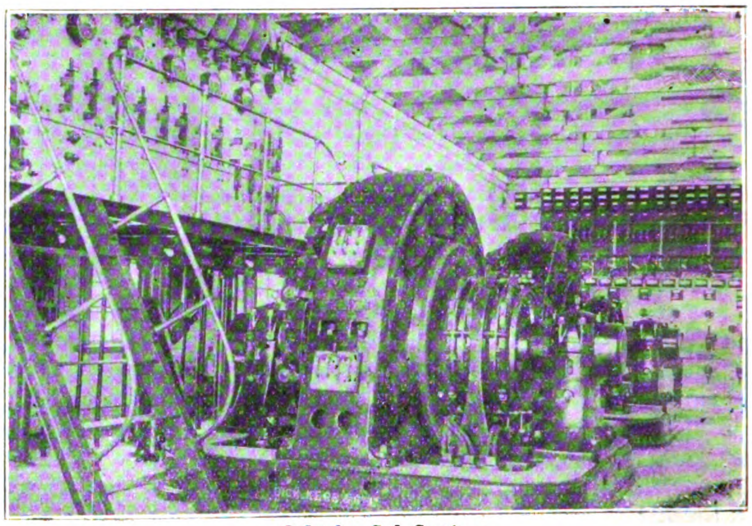
Net profit, therefore, would be something in excess of Y.1,201,000, in addition to the amount carried forward as surplus to this term, Y.10,000. It is proposed to put Y.65,000 to legal reserve, Y.65,000 for bonus to officials and Y.1,046,850, is to be distributed among the shareholders at the rate of 6 per cent. a year. This will leave Y.34,000 surplus to be carried to the next term.

SOME POWER STATIONS OF THE TOKYO ELECTRIC COMPANY

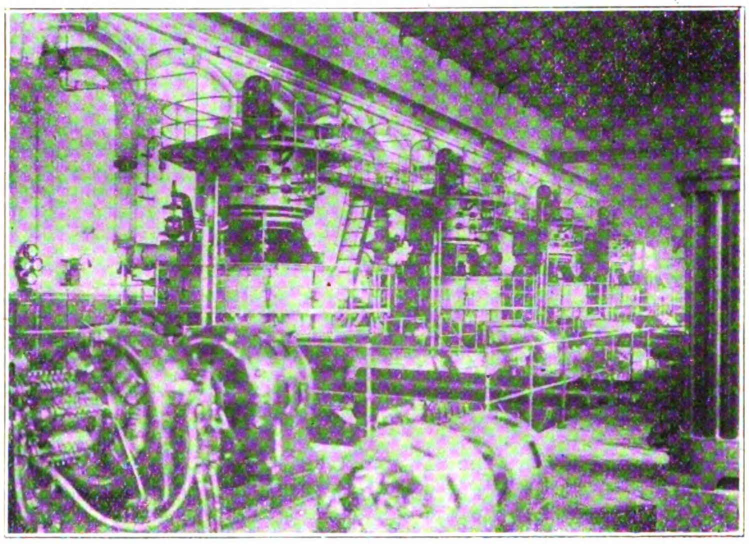
This Company has issued a call on its shareholders for Yen 20,000,000 for new construction



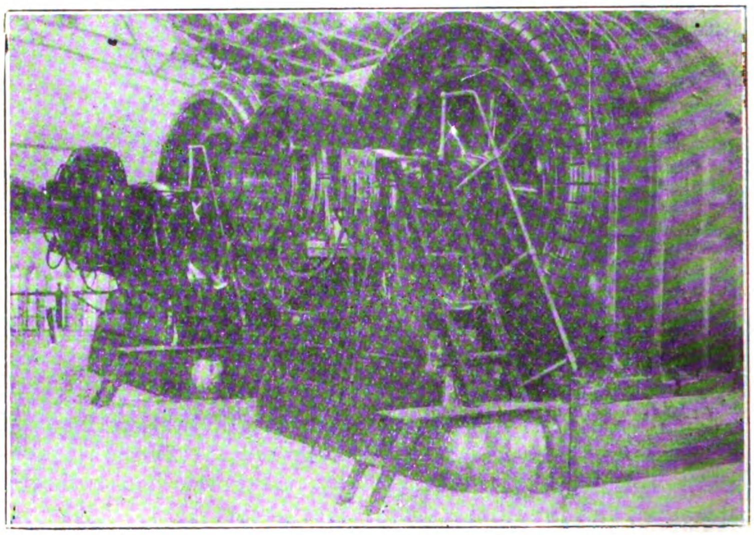
Yokoami Sub-Station



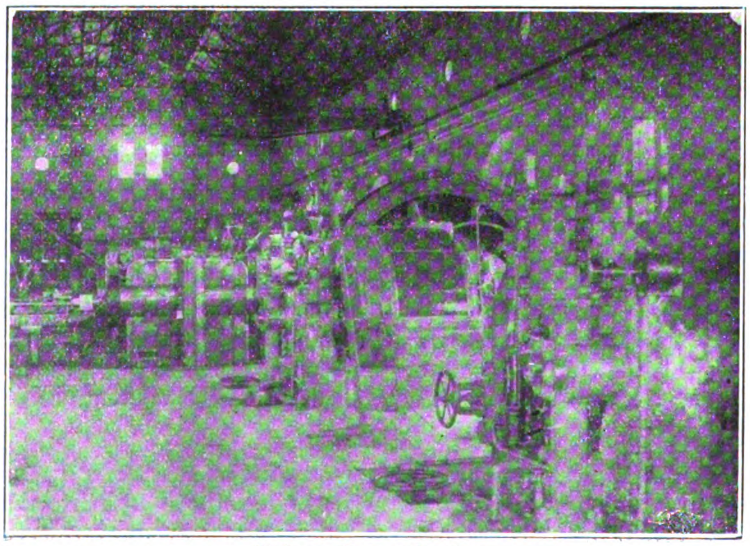
Oshicho Sub-Station



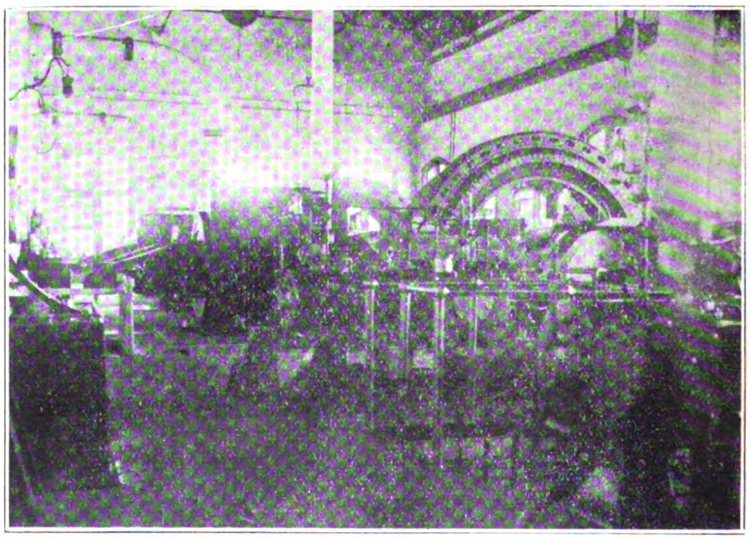
Fukagawa Power Station



Yurakucho Sub-Station



Shibuya Power Station



Shinagawa Power Station

THE FUTURE OF THE COMPANY:

The cost of construction of the company's water power plants is now estimated at Y.572 per kilowatt generated. This compared with other water power companies is very low. But as the company's area of supply is situated as a great distance from the source of power, it is required to erect long transmission lines. This increases the cost of construction per kilowatt generated to Y.750.00 or Y.760.00.

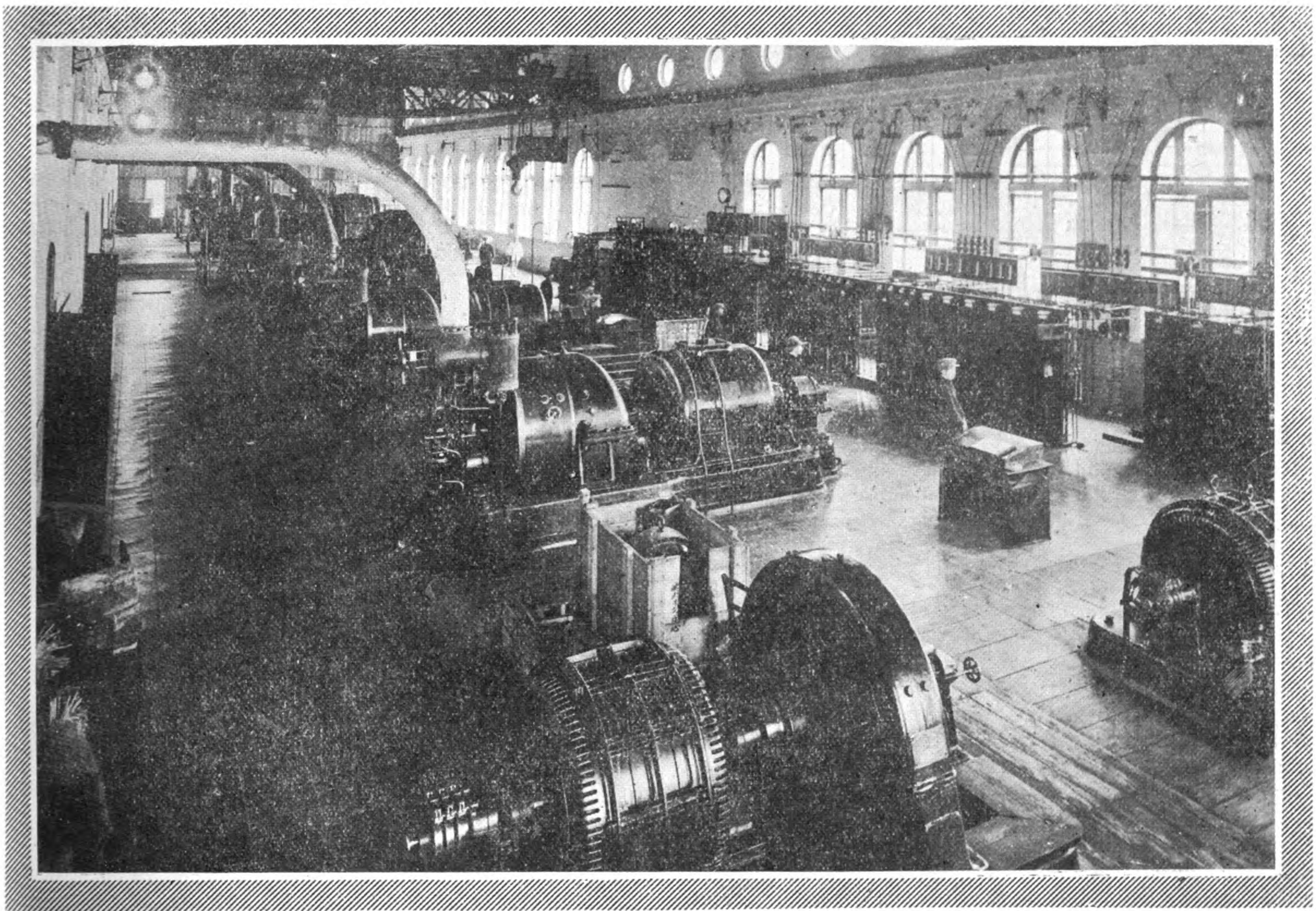
As a matter of fact the company's officials are finding that they do not need such a large amount of money to erect the transmission lines. But the nearer the lines come to Osaka the greater the expense of erection, as the land rental per pole is very high near that city. The annual rent per 36 sq. ft. of land is Y.3 to Y.5 a year. Because of the size of the iron towers erected some five to six times that amount of land is required so that the annual rental per pole is something like Y.20 to Y30. Such an annual charge would inconvenience the finances of any company.

When the Daido Electric Power Co., Ltd., begins transmitting power to Osaka that important industrial centre will be permanently relieved from the constant lack of power which is one of its competitive drawbacks to-day.

Nevertheless the Daido Denryoku has many troubles and hardships to face yet. Since its organization the public has looked on this company with a great deal of doubt. Accordingly the responsibilities of its directors are by no means slight. The success of the company is greatly to be desired because it plans important assistance to the development of Japanese manufacturing industries through its intention to supply Osaka with power.

2. Tokyo Electric Light Company

The Tokyo Electric Light Co. (Tokyo Dento K.K.) intends to call up Y.5.00 on each of its first issue new shares, and Y.7.50 on each of its second issue new, third issue new and fourth issue new shares, before the end of June, 1922. The total sum which this call will yield is estimated at a little more than Y.20,000,000.



Generating Room of the Kyushu Electric Light and Traction Company, equipped with General Electric Steam Turbine Sets: This company proposes to increase its capital Yen 37,400,000, a large proportion of which will be expended in new construction

However all this may be, the fact of the matter is that this company with its capital of Y.100,000,000 is the largest among Japan's water power companies. It is the expectation of the promoters of this company that it will eventually divide the exploitation of Japan's water power with the Nihon Denryoku K.K.

There are twenty company directors, and nine auditors. Mr. Momosuke Fukuzawa the most important figure in Japan's electric power industry is the president of the company, and Mr. Jiro Masuda is the vice-president, while such extremely capable business men as Mr. Koki Ota, Mr. Seiryo Yamane, Mr. Shigeru Kondo and Mr. Ju Sekiguchi, are all members of the board of directors.

The company intends to use the money in the following construction works:—

(1) Constructing transmission lines and transformer stations of the Shin-yetsu Denryoku K.K.

(2) Constructing the third power station on the Fuefuki river, to be completed this year.

(3) In completing the Komatsu power station, this year.

(4) To complete payments to the Keihin Denryoku K.K. (Keihin Electric Power Co.) with which the Tokyo Dento has some contracts in regard to investment.

The transmission lines of the Sin-yetsu Denryoku alone will require from Y.12,000,000 to Y.13,000,000 of this capital increase. It is accordingly confidently believed in electric circles that this company will be obliged to make another call on its unpaid capital after this call has been paid in.

3. Kyushu Electric Light Company

The Kyushu Denki K.K. in order to pay outstanding debts of Y.3,000,000 to the Mitsui interests, and Y.1,200,000 in company debentures, will call up the balance of its unpaid capital on June 1, 1922. The call will be for Y.12.50 a share, and will bring in Y.4,900,000.

It is reported that the company needs from Y.4,500,000 to Y.5,000,000 to complete its hydro-electric power stations at Oyama, Imahata and Chinda, in Kyushu, and also to put the coal power station at Fukuoka, with an estimated capacity of 10,000 kilowatts, into operation.

Other plans of this company are to erect power stations along the Oita River, the Kuma River and the Chikugo River, all in Kyushu. It also intends to make a large investment in the shares of the Kyushu Soden K.K. (Kyushu General Electric Co., Ltd.), when it is eventually organized. A large sum of money is accordingly needed by this company in the near future. To meet these needs it is reported that its present capital will be increased from Y.37,400,000 to Y.74,800,000, shortly after the final payment of the old capital is satisfactorily accomplished.

4. The Gunma Electric Light Company

The Gunma (prefecture) Denki K.K., was established in July, 1919, and it was the intention of the promoters to complete the first part of the power works before the end of 1921. But the bad weather delayed operations at one time to such an extent that the works were more than six months behind schedule. Now it is reported that they will be completed before the end of this half year, June 30, and that for at least five months in the second half year the company will be able to operate its power station at Kanai.

The Kamai hydro-electric power plant is connected by a high-pressure transmission line between Kanai, and Kawasaki, in Kanagawa prefecture, which is 85 miles long. This power station is built to generate 10,800 kilowatts at ordinary stages of water, and 7,800 kilowatts when it is at its lowest stage.

Trials of the company's equipment will be begun in June, 1922.

This company has a contract with the Keihin Dentetsu K.K. (Yokohama-Tokyo Electric Ry. Co., Ltd.,) for the supply of 6,000 kilowatts from the Kanai power station. The balance of the power generated will be sold in small amounts throughout Kanagawa prefecture in the districts between Kanai and Kawasaki.

Estimating the charge for power at 3 sen a kilowatt which is the minimum charge in the Kwanto (Eastern Japan) district, at the lowest stage of water this company's income should be about Y.455,000 for the five months of complete operation next half year. If the estimate is made at the highest stage of water, income should reach Y.550,000. Estimating expenses of operation at 20 per cent. of income, profits should amount to Y.430,000 or Y.440,000. This would be a profit rate of fourteen per cent., but it is reported that the company will confine dividends to 8 per cent. for the time being.

5. Inawashiro Hydro-Electric Company

At a general meeting of its shareholders held in Tokyo on the twenty-eighth of April, the Inawashiro Hydro-Electric Power Company, one of Japan's most important electric enterprises, decided to increase its capital from Y.21,000,000 to Y.50,000,000.

The capital increase will be effected in the following manners :—

(1) The present capital of Y.21,000,000, will first be paid-up in full by calling for a seventh and last payment of Y.10.00 a share on all shares issued.

New shares to the number of 580,000 will be issued, to the face value of Y.29,000,000, each share being Y.50.00 par.

(2) Of this total, 525,000 shares will be parcelled out among the present shareholders, before November 1, 1922, but it is desired to keep the distribution put off until the last moment legally permitted. One and a quarter shares of new stock will be allotted to each share of old stock.

(3) The balance of 55,000 shares will be distributed among the members of the company's office staff and other employees, and other persons who have rendered services to the company worthy of such recognition.

The purpose for increase of capital is found in the company's amended plans for completing the following projects, now under way, or soon to be begun.

	New Plan	Old Plan
(1) Deepening Lake Hinokibara ..	Y. 957,000	Y. 470,000
(2) Increasing equipment at No. 3 Power Station	5,448,000	5,010,000
(3) Increasing equipment at No. 4 Power Station	8,429,000	2,620,000
(4) Deepening Lake Inawashiro ..	4,028,000	3,750,000
(5) Equipment, etc., at Tabata transformer Station	1,780,000	1,640,000
(6) High-pressure transmission lines ..	6,560,000	8,330,000
(7) Completing Odera business office ..	448,000	—
(8) Reserve	1,350,000	2,180,000
Total	Y.29,000,000	Y.24,000,000

Sprinklers in Sakhalin

It may be remembered that, on the conclusion of the Russo-Japanese war, the southern part of the Island of Sakhalin was ceded to Japan. Previously the whole of it had belonged to Russia, and was used by that country as their great convict station, and readers of Charles H. Hawe's fascinating book "In the Uttermost East" will remember his vivid description of the horrors of life in that far-off settlement.

Since taking possession of the southern portion of the island, the enterprising Japanese have developed there the manufacture of wood pulp, and the illustration on this page shows the main street of a village on its west coast in which one of these factories is situated. In the foreground to the right is Mr. John Birtles, the English engineer, who is superintending the erection of the Grinnell automatic sprinkler installation in the pulp mill, together with two Japanese gentlemen connected with the same undertaking.

The photograph, which was taken on November 1st, 1921, gives some idea of the severity of the climate even in earliest winter.

Irrigation Development in Siam

IN the beginning of the year 1913, the preceding rice harvest having been a very bad one, the question of irrigation, for some years in abeyance, began once more to occupy the attention of the government. As a result of investigations into the matter extending over many months, the minister of agriculture submitted a note to the king strongly advocating the undertaking of a scheme of irrigation in the Menam valley. In this note it was suggested that a foreign irrigation expert of reputation be engaged to report on the situation and, if his report should prove satisfactory, to initiate work. Shortly afterwards, the minister of agriculture took measures to secure the services of an irrigation expert of wide recognized experience, which measures resulted in the loan of the services of Mr., now Sir Thomas, Ward, C.I.E., M.V.O., by the government of India.

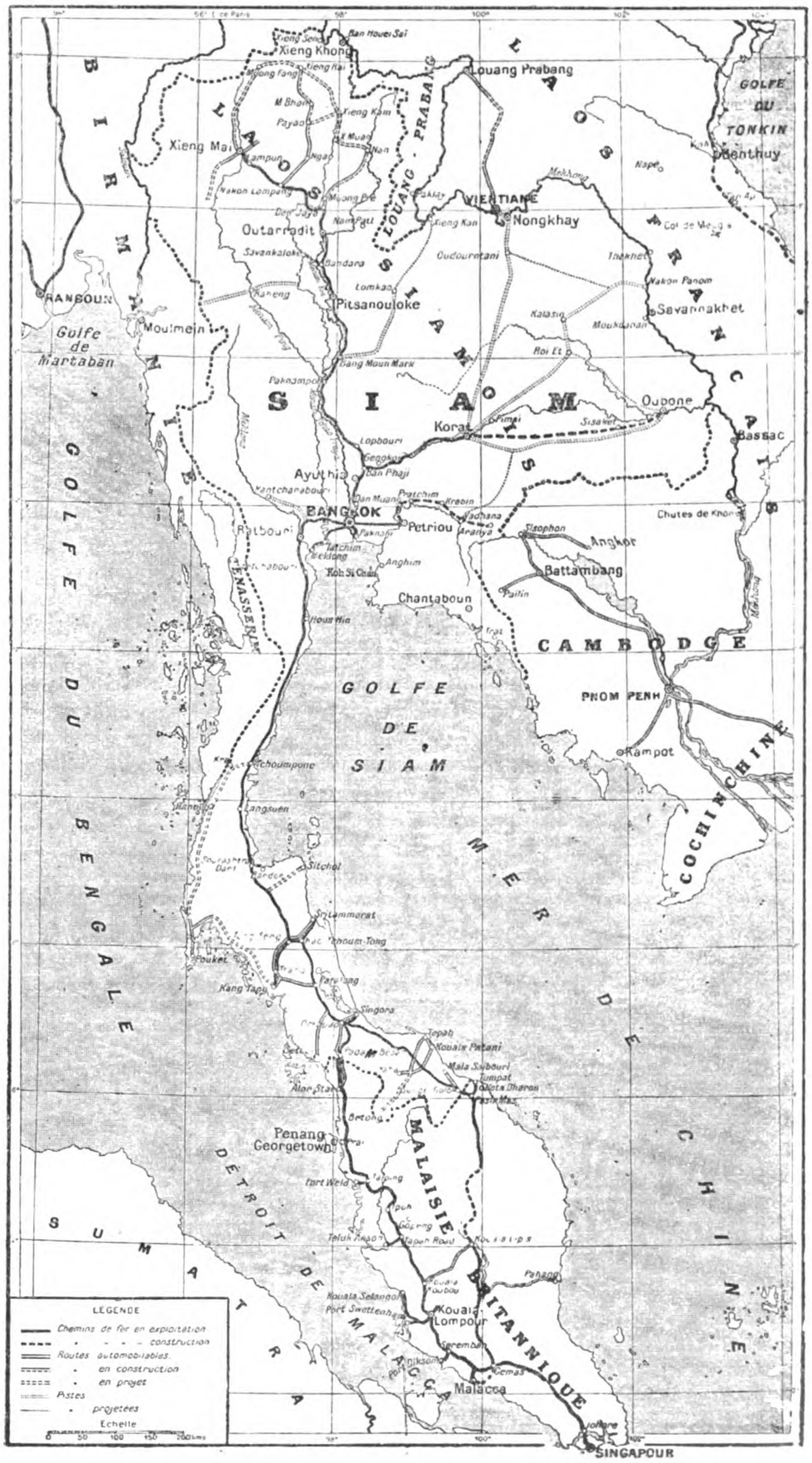
Sir Thomas Ward arrived in September, 1912, with selected assistants, and immediately began to investigate, the plans and estimates formerly compiled in the irrigation department being placed at his disposal. An office was established and a staff of officers was collected and before long parties of surveyors and levellers were out in all directions verifying the old plans and compiling new. Sir Thomas himself traveled extensively, and by actual observation and with the help of his assistants soon acquired an intimate knowledge of the country and the conditions affecting irrigation.

By about August, 1915, the whole question had been worked up very exhaustively and with the assistance of various departments of government, notably the war department (krom penti) and the Mahatai, many maps had been prepared and a mass of statistics regarding population, crops, rainfall and revenue had been collected and assimilated. Sir Thomas Ward then began to draw up a report and projects, but meanwhile steps were taken to form an irrigation department in preparation for the moment when actual construction should begin. Mr. R. C. R. Wilson, of the Punjab irrigation service who accompanied Sir Thomas Ward to Siam, was appointed director, and an officer was engaged in India for the position of deputy director. Arrangements were made to fill other appointments of the department from the staff which had been working on the projects.

Sir Thomas Ward delimited six different areas which could be irrigated (each by means of its own self-contained system of canals) by the three rivers of central Siam and by each of the three distributaries of the Menam Chao Phaya; and he found and fixed the boundaries of a central part that extends from Ayuthia to the sea, too flat for irrigation except to a limited extent but which could be developed by the further construction of navigation and drainage works similar to those which had already been constructed by the irrigation department. He prepared preliminary projects explaining the relative merits of each of these integral parts and set forth the work to be done to obtain the ultimate full development of the country on the most modern and up-to-date lines. In doing this Sir Thomas explained that the attainment of such full development must occupy a long period of years and entail a total expenditure of something like 150 millions of badh and would moreover become necessary only after Siam should have acquired a population sufficiently numerous to occupy all the land thus made available.

Sir Thomas Ward advocated, to meet immediate needs, the execution of a selection of his separate projects, giving preference to those which seemed of most importance, at a total cost of some 22 or 23 million badh; that being about the sum which Sir Thomas was given to understand that the government desired to spend to attain the object that they had in view, viz., to enable Siam to maintain, against the increasing competition of neighboring rice-growing states, the position hitherto held by her in the markets of the world. Sir Thomas estimated that such a sum would provide for the immediate expansion necessitated by the ever increasing energies of the people consequent on the just and stable rule that they now enjoy.

After careful consideration of the immediate needs of the different tracts of country from the point of their irrigation potential-

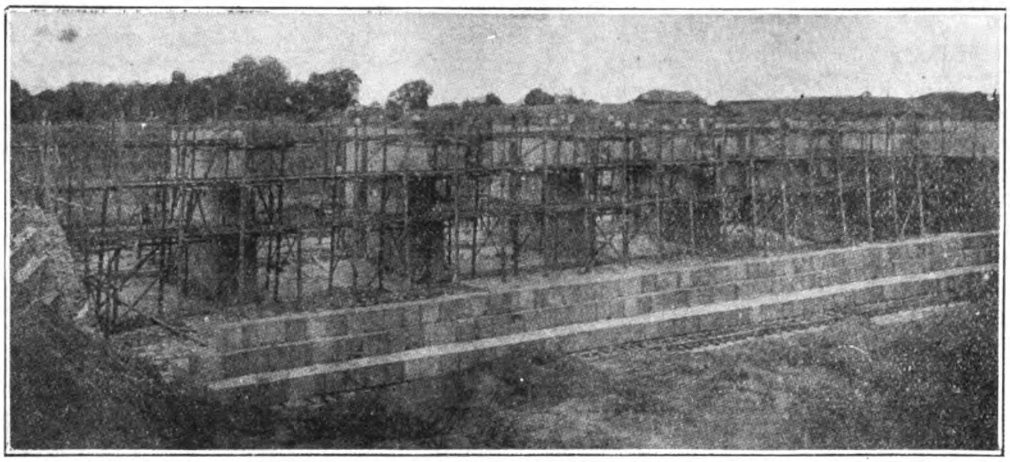


ities, and of the views held by the statesmen of Siam, Sir Thomas Ward advised the immediate sanction of the following projects :—

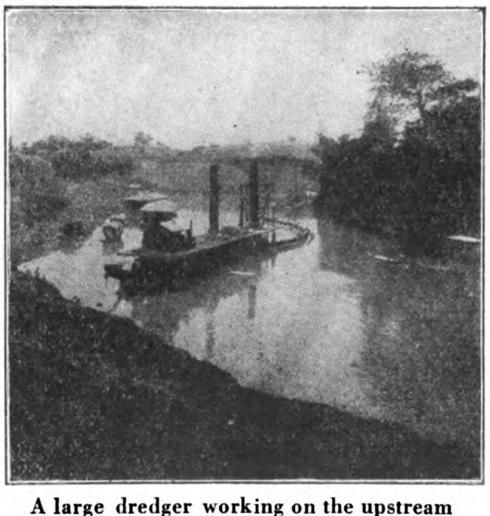
	Ticals.
(1) The Subharn canal	7,500,000
(2) The Bhejaburi east canal	1,500,000
(3) The Prasak south canal	11,500,000
(4) Hill irrigation (Circle Bhayabh)	1,500,000
(5) Navigation and drainage work in the flat plain from Ayuthia to the sea on both banks of the Menam	1,250,000
Grand Total ..	22,750,000

The following are points of interest concerning these various projects :—

No. 1. *The Subharn Canal.*—Sir Thomas Ward found from the records of the river gauge maintained at Wat Dahad on the Menam near Jainadh since the year 1904, that the water levels obtaining annually between the months of July and December would suffice for the irrigation of certain areas of land, if canals were opened up along the Subharn, the Menam Noi and the Lopburi off-shoots from the main Menam Chao Phya river. He also found that the lands along the last of these off-shoots were already in a prosperous condition and might safely be left alone until the others had been brought to an equal condition. It was chiefly for the improvement of the lands watered by these three off-shoots that the scheme of a great barrage at Jainadh had been suggested by a former irrigation expert. Sir Thomas Ward considered that such barrage, though doubtless a work of much potential value, might be left over for a time, and thought that it would suffice for the immediate needs of the country to spend 7,500,000 each on a complete system of scientifically constructed canals leading from the Subharn river, thoroughly carried out to the last detail of the field embankments and ditches. The cost of this last item, it should be noticed in passing, would be paid by the landholders but the construction would be carried out for them by the government engineers at an estimated outlay of about one tical a *rai* owned. It was an integral part of Sir Thomas Ward's scheme that this cost of embankments and ditches should be lent by the state to the landholders on suitable terms, to safeguard the community from the load of debt which has so frequently overwhelmed badly throughout irrigation enterprises, where the state, from want of experience, has not assisted the farmers in the right way at the right time.



Irrigation development is progressing in the Kingdom of Siam under the direction of the Royal Irrigation Department. This photograph shows the construction of a large barrage in connection with this development



A large dredger working on the upstream end of an important cut-off

No. 2. The Bhejaburi river, if provided with a barrage at Wad Dhagoi, could feed canals on either bank so as to ensure the rice crop against breaks in the rains. The barrage at the above-mentioned spot and a canal for the tract lying between the river and the sea, would ensure a good measure of prosperity for the people of the district. If at a later date, further demand should arise, canals on the other side of the river, that is between the river and the hills could also be carried out.

No. 3. The works on the Prasak river were designed to complete the Glohng Rangsit system of canals, the lease of which lapsed to government in April, 1914. It appeared to be necessary to make this tract as prosperous as possible so that there might be no undue emigration of tenants to the Subharn, after the development of that district. Sir Thomas Ward urged that it was all important that what might be done in the inauguration of irrigation should be complete and thorough, so that the farmers all over Siam should realize the advantage to agriculture of modern scientific work.

No. 4. Though Sir Thomas Ward was not directly concerned with questions of irrigation beyond the limits of the great central plain, circumstances brought the agricultural condition of the Bhayabh circle to his notice, and one of his officers, Mr. Freeman, while in the Krom Tang, examined the country and drew up a scheme for improving the rice-growing conditions of Nagorn Lampang. Sir Thomas Ward considered that the general scheme of Siamese irrigation should embrace the Bhayabh circle so that the harmonious development of rice-growing in the different parts of the kingdom could be secured, to the end that all might share alike in the benefits of the stable government it is the good fortune of the people to enjoy. Sir Thomas Ward recommended that the scheme for Lampang be sanctioned as soon as possible and that an officer should be sent to get out detail plans and estimates and at the same time work out preliminary projects for the other valleys of Bhayabh on the same lines as he was doing for the plains of Siam.

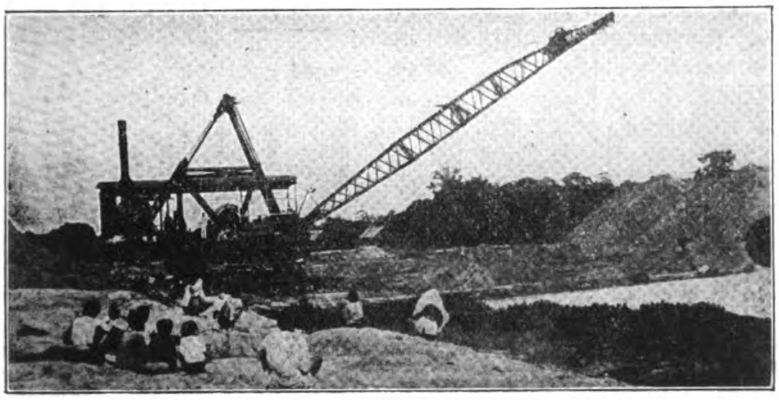
No. 5. Sir Thomas Ward considered that the further development of the navigation and drainage canals and flood control works, in the low, flat part of the central plains should be continued on much the same lines as those followed during the ten years preceding his deputation to Siam. He thought that 1,250,000 badh would be a suitable sum to ear-mark for expenditure on such works during the six or eight years it would take to construct the projects for which he was advising sanction.

Prasak Canal Project

Of the several projects drawn up the government decided, for various reasons, that the Prasak south canal scheme should precede the Subharn canal scheme, and preliminary work was begun at the end of 1914; actual construction work being started in November, 1915, when the necessary excavating machinery had arrived from the United States of America and had been erected.

The site for the headworks of the canal, as finally selected, is at Dha Luang, about 6 kilometres in a direct line from Dha Rua station on the northern railway. The original site proposed for the headworks was at Saraburi, but if they had been built

there, the Prasak canal would have depended for all time solely on the Prasak river for its supply, and in the event of the Menam Chao Phaya ever being tapped by means of a weir at Jainadh or thereabouts, the Prasak canal system could not have benefitted thereby. With the headworks built at Dha Luang, the Prasak canal will become an important link in any big general system of irrigation from the main river that may be constructed in the future, as well as being properly situated to absorb the whole of the water available from the Prasak river.



One of three Class 175, B. Bucyrus Dragline Excavators working on the Siamese Government Irrigation System

The headworks consist of a barrage across the Prasak river, the head regulator of the canal, and two locks, one for through river traffic and the other for traffic between the river and the canal.

The barrage consists of 6 spans of 12.5 metres each, and is provided with single-lift steel gates worked on the Stoney principle of free rollers. These gates are probably the highest single-lift gates ever constructed on this principle. The piers and abutments are 12.0 metres above river bed, surmounted by steel towers and an overhead operating bridge, the total height from river bed to the platform of the bridge being 20.10 metres. The barrage is founded entirely on clay and, in order to attain an even intensity of pressure within safe limits over the whole bed when working under full load, the foundations have been constructed as a solid slab of concrete reinforced with steel rails pinned into the river bed by solid concrete extensions under the piers. The piers and abutments as well as all works at Dha Luang are constructed of random rubble masonry, worked up in courses, and in order to obtain a good through bond, concrete slabs reinforced longitudinally and transversely have been added at intervals. Cement mortar, with cement from the Siam Cement Company's works, has been used throughout and the stone used is a tough durable limestone that has been quarried by the irrigation department at their own quarries at Pak Prio.

The contract for the steel-work and the gates for the barrage was placed with Messrs. Glenfield and Kennedy, of Kilmarnock, Scotland. The head regulator of the canal consists of 8 spans of 4.2 metres each, provided with gates to work on the Stoney principle as adopted for the barrage. These gates were built by the department at their own workshops in Bangkok. The total cost of the headworks will amount approximately to Tcs. 2,300,000, being Tcs. 1,000,000 in excess of the original estimate, which was framed entirely on a pre-war basis.

The Main Prasak canal runs in a south-easterly direction to Nong Ge, a distance of 32 kilometres, where it bifurcates into two branches both connecting with the existing Rangsit system ; the western branch joins Ghlong Hok Wah Sai Bon, and the southern branch Ghlong 13. The main canal at its head has a bed width of 40 metres and a depth of 3 metres. The designed slope is 1 in 13,500 and its discharge 100 cubic metres per second. Provision has been made for the crossing of four large drainages carrying about 120 cubic metres per second, and the works for these have been so constructed that their supply may be absorbed into the canal for irrigation purposes, or passed under the canal when not required. The main canal and branches are provided with locks and will afford a better waterway for traffic to the capital from the Prasak river, and also from that river to the Prachim side, than at present exists. In addition, provision is being made for the transfer of traffic from the canal to the northern railway at Nong quay where the Korat line crosses the main canal by means of a reinforced concrete bridge.

Distributing channels take off from the main canal and the two branch canals, and from these again minor channels and water courses deliver the water on to the individual cultivator's fields. The main canal, the western branch canal and the system of distributing channels connected with these are nearing completion, and actual irrigation from then will commence for the rice crop of 1921.

The area to be protected annually by direct irrigation is estimated at 100,000 hectares, or 625,000 rai. Furthermore by linking up the new system with the old communication canals and creeks to the southward of Ghlong Hok Wah Sai Lang and utilizing the surplus water of the Menam Nakonayok, a copious flow of fresh water will be provided for the great and fertile, though low-lying plain, bounded by the Rangsit area on the north, the Menam Chao Phya on the east and the sea on the south. This water which will replace the noxious saline fluid, inimical to plant and animal life, that now stands in the canals and creeks of this area for a great part of each year, will supply irrigation of the kind known as indirect, or flood irrigation, consisting of the alternate flooding and draining of the land by one and the same set of channels according as desired. Thus in addition to the area directly affected, a very large tract will be indirectly benefitted by the system. It is to be noted that to obtain the best results in rice cultivation an efficient drainage system is practically as important as the supply of water.

The revised estimate for the Prasak project at present stands at Tcs. 13,300,000 and the expenditure up to March 31st, 1919 is as follows :

2458 B. E. (1915-16)	.. ..	Ticals.	388,402*
2459 B. E. (1916-17)	.. ..	,,	1,273,559
2460 B. E. (1917-18)	.. ..	,,	1,664,015
2461 B. E. (1918-19)	.. ..	,,	2,655,382
2462 B. E. (1919-20)	.. ..	,,	2,495,812
2463 B. E. (1920-21)	.. ..	,,	3,884,289
	Total ..	,,	12,361,459

*Includes expenditure on other projects Tcs. 238,815.24

Of the above sum Tcs. 2,000,000 has been expended on machinery, stores and plant which will be available for use on other projects if sanctioned.

Kawasaki Estimating on Sydney Bridge

The Kawasaki Dock Yard Company of Kobe some time ago received an invitation from the government of New South Wales, Australia, for an estimate on a bridge to span a gulf of the Sydney Bay which bridge is expected to be one of the longest bridges in the world. The bridge is to be 1 mile long, 100-ft. wide, with four broad-gauge car tracks, one automobile road, and two roads for pedestrians. Any of the largest battleships afloat in the world will be able to pass beneath the bridge.

Workshops of the N.E.I. Railways

CHIEFLY for the up-keep of the rolling stock, consisting in 1919 of more than 500 locomotives, 1,600 carriages and 11,000 cars and also for the repairs necessary to keep the other railway works in good order and also for the construction of new lines, the service of the state railroads-and tramways possesses in Java six workshops, viz., three main workshops at Manggarai, at Bandoeng and at Madioen and three auxiliary workshops at Poerworedjo, at Sourabaya-Goebeng and at Djember.

The short enumeration proves clearly that the range of work done in these workshops and especially that by the main workshops is more manysided and intricate than generally is the case in Europe for such establishments. Assistance from the private industry is almost wholly excluded; on the contrary, often assistance has to be given to private persons or companies and also to other government's services. Every part of the work has to be executed by the workshops themselves, consequently the extent of the forges and the foundries forms a striking feature.

The situation of these workshops at nearly equal distances along the mainline, which has developed chiefly in a longitudinal direction, may in general be considered a very good one; for instance the workshops at Manggarai and at Sourabaya-Goebeng, which are situated near the two largest harbors on Java's northcoast, viz., Tandjong-Priok and Sourabaya, also those of Poerworedjo near the growing port of Tjilatjap on Java's southcoast, are favorably situated with regard to the accumulation of rolling stock in the neighborhood of these harbors, whereby the transport of defective rolling stock has been reduced to a minimum. The work shops at Bandoeng, situated in the midst of its plateau, have chiefly to repair the heavy mountain-locomotive, running on the Preanger lines and of the other rolling stock, used on this plateau, which stock has therefore not to be transported for repairs over the mountain-lines of the railway with their limited traffic capacity. The workshops at Djember situated in the centre of Eastern Java has to keep in good order the stock, used in these more remote parts of the country.

The mainwork shops at Madioen are less favorable situated.

It stands to reason that the capacity of the workshops had to keep pace with the very rapid increase of the rolling stock; consequently during the period from 1912 till now.

(1) A quite new workshop for cars and carriages was built at Sourabaya-Goebeng instead of the old one at Sourabaya-kotta, which could not be enlarged.

(2) The workshop at Madioen was enlarged and modernised, but in such a way and on such a scale that it might be considered as a newly built one.

(3) Quite new, modern mainwork shops were built at Manggarai as a substitute for the old ones of the N. I. S. at Boekit Doeri (Meester-Cornelis), which also could not be enlarged.

(4) The other workshops especially those at Poerworedjo—were more or less extensively enlarged with regard to buildings as well as to equipment.

Next some figures may be mentioned to give an idea of the working range of the shops.

On the first of January, 1919, there were employed in the different workshops. :—

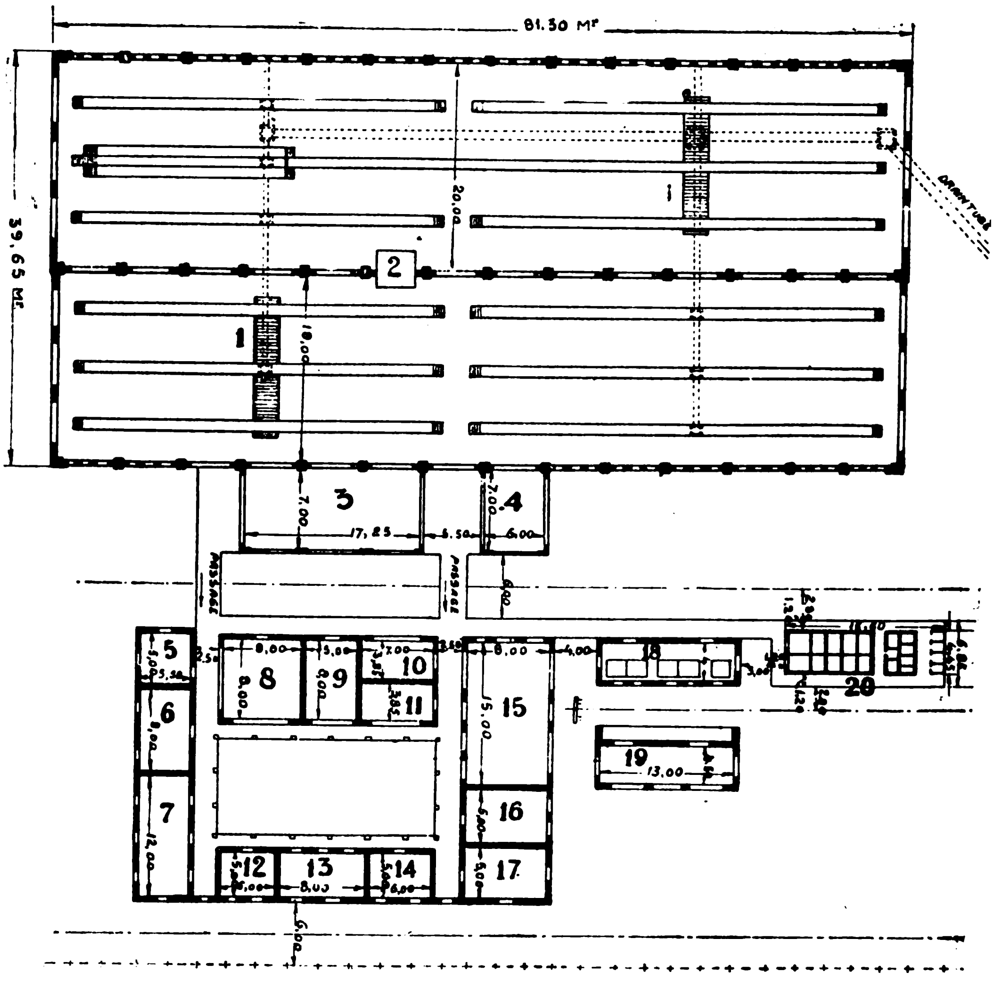
	Laborers	Apprentices	Coolies
Manggarai .. .. (for the greater part still in erecting stage)	652*	125	86
Bandoeng	1,009	73	245
Poerworedjo	390	40	20
Madioen	1,332	176	144
Sourabaya-Goebeng	892	100	100
Djember	444	70	74
Total ..	4,719	584	669

or in total 5,972 men, supervised by one chief engineer, 7 engineers, 9 mechanical inspectors, 26 foremen, 32 overseers, 13 apprentices and 40 shift-foremen.

During the year 1918 there has been paid on wages and salaries *f* 1.285, 628, 37 and *f* 484, 705, 71 respectively.

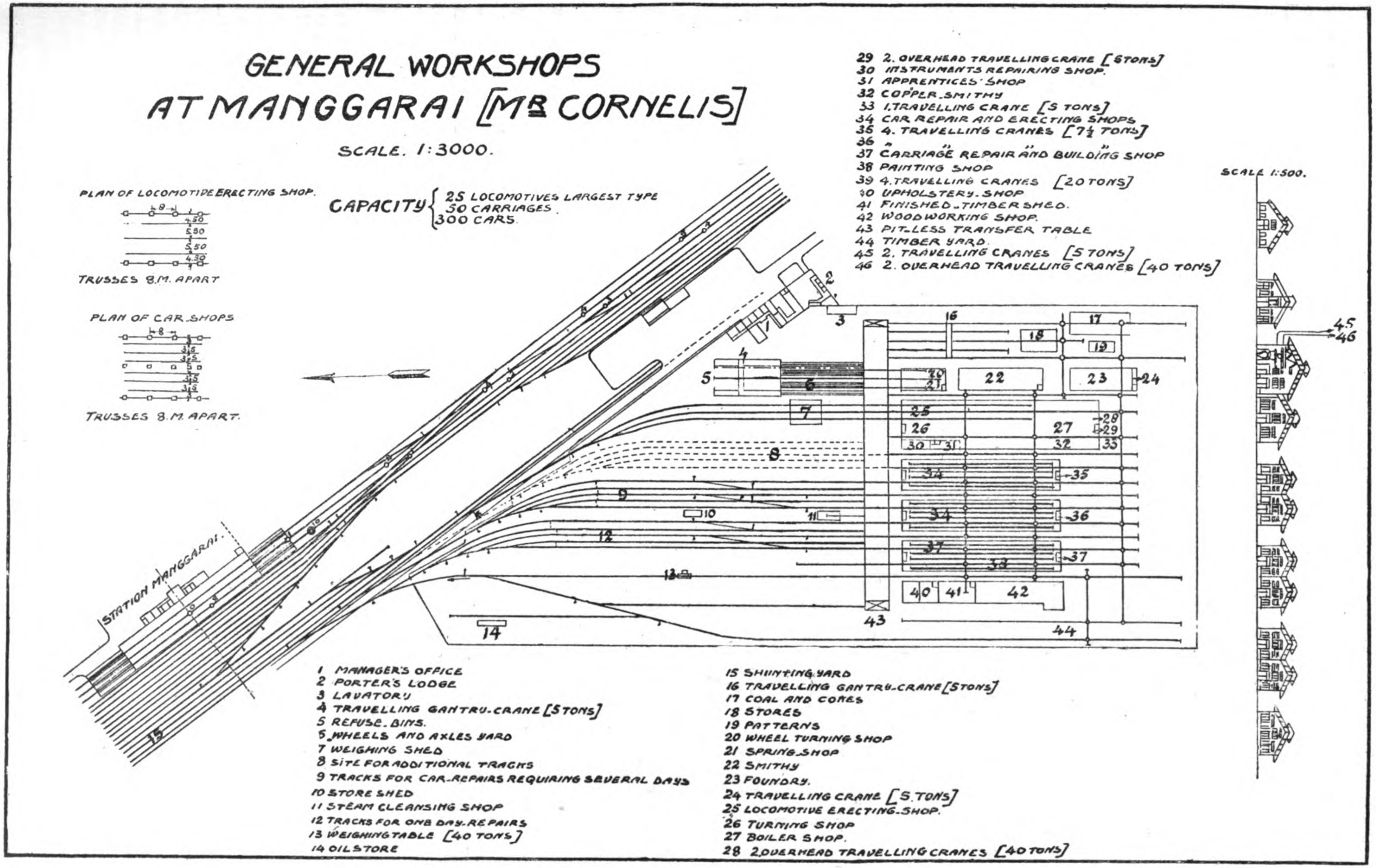
The motive power of the workshops is partly electrical and partly derived from steam-engines.

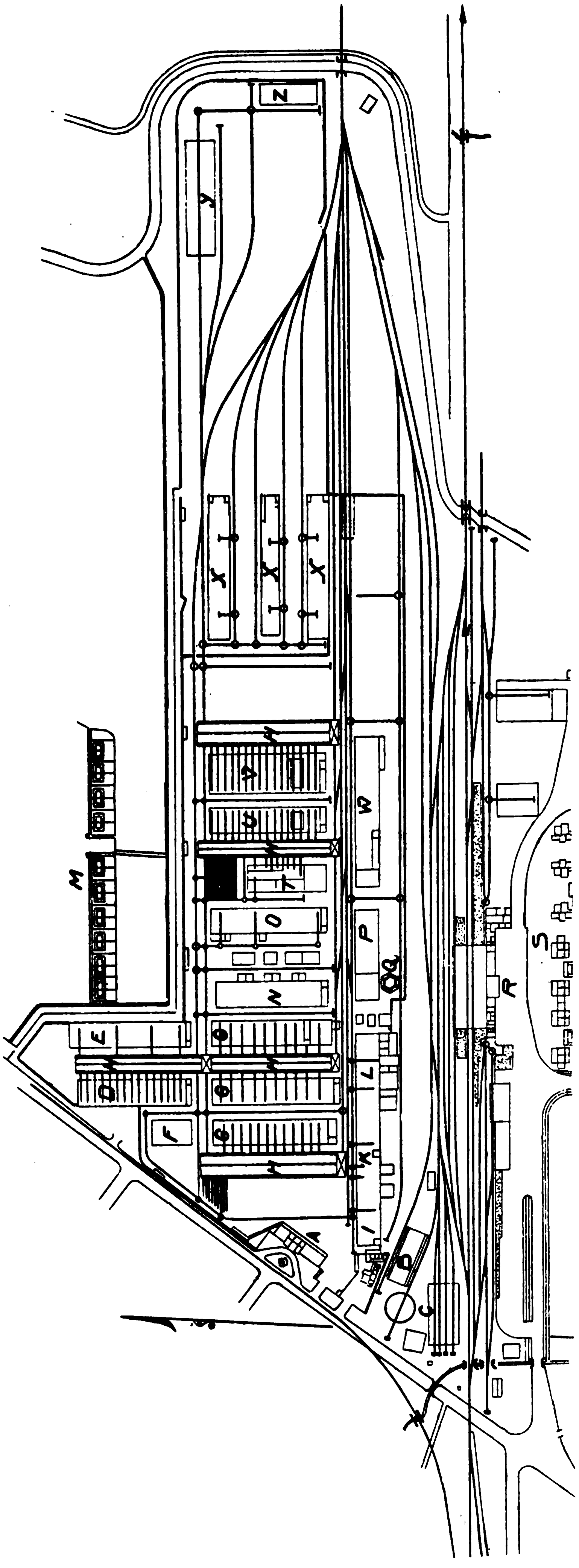
* This number will be more than doubled when the erecting of the workshop delayed by the war, is wholly finished.



LOCOMOTIVE SHED AT MEESTER CORNELIS

1 Transverse Axle Pit
2 Foreman's Office
3 Electric Equipments' Repair Shop
4 Smithy
5 Foreman's Office
6 Assistants' Office
7 Office
8 Store for Finished Parts
9 do.
10 Night Firemen's Tools
11 Cloak Room
12 European Employee's
13 Lecture Room
14 European Employee's
15 Store for Unfinished Parts
16 Native Drivers
17 Native Firemen
18 Oil Tank Room
19 Oil Drumstore
20 Bathrooms and W.C.'s


GENERAL WORKSHOPS
AT MANGGARAI [MR CORNELIS]
SCALE. 1:3000.
CAPACITY { 25 LOCOMOTIVES LARGEST TYPE
50 CARRIAGES.
300 CARS.
PLAN OF LOCOMOTIVE ERECTING SHOP.
TRUSSES 8.M. APART
PLAN OF CAR SHOPS
TRUSSES 8.M. APART.
SCALE 1:500.
STATION MANGGARAI.
1 MANAGER'S OFFICE
2 PORTER'S LODGE
3 LAVATORY
4 TRAVELLING GANTRY-CRANE [5 TONS]
5 REFUSE. BINS.
5 WHEELS AND AXLES YARD
7 WEIGHING SHED
8 SITE FOR ADDITIONAL TRACKS
9 TRACKS FOR CAR-REPAIRS REQUIRING SEVERAL DAYS
10 STORE SHED
11 STEAM CLEANSING SHOP
12 TRACKS FOR ONE DAY-REPAIRS
13 WEIGHINGTABLE [40 TONS]
14 OIL STORE
15 SHUNTING YARD
16 TRAVELLING GANTRY-CRANE [5 TONS]
17 COAL AND COKES
18 STORES
19 PATTERNS
20 WHEEL TURNING SHOP
21 SPRING-SHOP
22 SMITHY
23 FOUNDRY.
24 TRAVELLING CRANE [5 TONS]
25 LOCOMOTIVE ERECTING-SHOP.
26 TURNING SHOP
27 BOILER SHOP.
28 2.OVERHEAD TRAVELLING CRANES [40 TONS]
29 2. OVERHEAD TRAVELLING CRANE [5 TONS]
30 INSTRUMENTS REPAIRING SHOP.
31 APPRENTICES' SHOP
32 COPPER-SMITHY
33 1.TRAVELLING CRANE [5 TONS]
34 CAR REPAIR AND ERECTING SHOPS
35 4. TRAVELLING CRANES [7½ TONS]
36 "
37 CARRIAGE REPAIR AND BUILDING SHOP
38 PAINTING SHOP
39 4.TRAVELLING CRANES [20 TONS]
40 UPHOLSTERY-SHOP
41 FINISHED-TIMBER SHED.
42 WOODWORKING SHOP.
43 PIT-LESS TRANSFER TABLE
44 TIMBER YARD.
45 2. TRAVELLING CRANES [5 TONS]
46 2. OVERHEAD TRAVELLING CRANES [40 TONS]



GENERAL WORKSHOP AT MADIOEN

A. Head office
B. Coal shed
C. Locomotive shed
D. Tender shop
E. Boiler shop
F. Coppersmithy
G. Locomotive repair shops
H. Transverse tables
I. Small fittings' shop
K. Turning shop
L. Larger fittings' shop
M. Native workmen's compound
N. Foundry
O. Smithy
P. Finished timber shed
Q. Water tower
R. Station building
S. Officer's houses
T. Wheel and tire shop
U. Car repair shop
V. Carriage repairing and building shop
W. Woodworking machinery and carpenters' shop
X. Stores
Y. Coal shed
Z. Tar, oil and inflammable matter

Electric power is used in the workshops at Manggarai, Bandoeng, Madioen and Sourabaya-Goebeng.

In this connection it may be observed that Madioen and later on Manggarai also, receive the necessary current from governmental central stations, whilst the two other workshops are connected to local electric power plants.

The kind of current, however, is the same in all the workshops, viz., three-phase current of 220 volts at 50 periods per second.

A reserve of calorie energy is to be found in the workshops at Bandoeng and Madioen, as to that at Manggarai and Sourabaya-Goebeng, the reserve power is provided for by the local central station.

All the workshops with exception of the new one at Manggarai, are built on the transversal system with tracks (traverse to the main ones) for the locomotives, carriages or cars placed in several buildings, whilst their transportation is effected by means of transfer tables between those buildings, e.g., as shown in the plan of the workshops at Madioen.

The workshop at Manggarai is built according to the longitudinal system, whereby the rolling stock is put on in groups of three tracks, the middle one serving for circulation.

These tracks are placed longitudinally in the buildings. The transposition is effected by means of highly elevated traveling-cranes.

In connection with this it ought to be mentioned that the distances between the tracks and the height of the locomotive erecting shop are dimensioned in such a manner, that, when during busy times the middle tracks are also filled up with locomotives to be erected, revised or repaired, every engine may be lifted and transported clear over the other ones. This requirement necessitates a great height of the building but at the same time it allows the application of light erecting cranes traveling under the heavy transfer-cranes.

With the longitudinal system it is evident that similar cranes are used for lifting cars and carriages, which with the transversal system is effected by means of either cranes or gantry cranes c. q. jackscrews and carriage jacks.

For the new following short survey of the arrangement and methods of the workshops these at Manggarai and at Madioen are taken as examples, because in these both systems have found an expressive application (*vide* the appended ground-plans).

To both workshops is adjoined a small shunting yard either for the collection of the already repaired or the distribution of the to be repaired rolling stock over the different departments or to keep it at the disposal of the traffic-service.

In both workshops the locomotive and also the carriage and carshops have got a common machine-shop, which at Madioen is situated between those sections but at Manggarai partly between them (turning and fittingshop) and partly outside (forge, foundry) in such a manner, however, that as much as possible the transport is following one line and is limited to a minimum.

The mechanical woodworking department is in both cases situated as near as possible to the carriage building shop, therefore here also the transportation is limited to a minimum, whilst the timber is as nearly as possible following a straight line from the staple-yard to the saws.

Furthermore, provision has been made that future extension is rendered possible without interruption of the logical sequence of the whole scheme, which condition may be satisfied entirely, especially with the longitudinal system, by simply lengthening the sheds without in any way impairing the conjunction of the different departments.

The workshops' capacity comprises at Madioen 36 locomotive stands and 36 roof-covered carstands, whilst at Manggarai, initially, provision has been made for the simultaneous presence of 20 locomotives, 50 carriages and 300 cars (the repairs of the latter can mostly be effected in the open air, for which purpose a large yard with the necessary tracks is reserved in front of the workshop buildings.

Although the motive power for both workshops is the same, viz., three-phase current at 220 volts, there is some difference in the driving, to wit, at Madioen in groups, whereby one motor drives a mainshaft supplying power to several machines whilst at Manggarai the single drive system has been preferred, whereby every machine or lathe is driven by its own separate motor fixed to it.

About the arrangement of the cranes in the workshops at Manggarai the following may be mentioned in addition. In the locomotiveshop there are two lifting and traveling cranes with a capacity of 40 tons each with railtracks elevated to such a degree that if need be a locomotive may be lifted and transported right over the other ones. As already has been pointed out, the object of this is to be able to place locomotives on the middle track also when the side-tracks are insufficient or too crowded. These cranes serve also to transfer the boilers to the boilershop which is situated at the back of the locomotiveshop.

Under these elevated tracks are situated those for the 5 tons traveling erecting cranes.

The frequently occurring necessity to carry heavy pieces in the turning shop and in the foundry is served by cranes also of 5 tons capacity.

In the sheds destined for car-repairs there are installed eight 7½ tons traveling cranes acting in pairs and destined to lift cars.

In the carriage-shed we find four 20 tons cranes for the raising of carriage-bodies and also working in pairs. The crane-tracks in the car and carriage sheds, however, are not so elevated, that the vehicles can be lifted clear over each other, such as is the case in the locomotive shop.

On the yard there are furthermore two gantry cranes of 5 tons capacity, one is moving above the wheel-yard, the other one above an open space, where engine-cabs, tenders and such parts are repaired.

In front of the various buildings a "surfaee traverser" of 40 tons carrying capacity is moving transversely to facilitate the transport in the workshop.

This table has not a sunken track therefore it does not impede the pedestrian traffic in the workshop contrary to the transfer tables at Madioen, which all of them are of less recent design and wholly sunk below ground level.

Mining in Celebes

AT a meeting of the geological and mining society for the Netherlands and colonies at Delft Mr. K. van Vuuren, head of the encyclopedic service in India, lectured on the question as to whether Celebes as a mining country has a future.

First then, from a theoretical standpoint, it may be said that metallic substances are to be found in Celebes ; but it is also quite certain that there are non-metallic substances there also such as phosphate and nitrate in the lime, precious stones, mica which is to be found in large quantities at Banggai, sulphur in every warm spring, potteryclay and sand for manufacturing glass, and the fossil remains of timber.

Secondly, the situation of Celebes for less valuable mining products is unfavorable. Of course there will come an improvement in our transit-trade, should our archipelago play again the roll of " half-way house " between China and Japan on the one side and Australia on the other side ; but this can only have a small influence on mining in Celebes.

Thirdly, traffic conditions on the whole are unfavorable, except in the south-west, and the Malili country.

And lastly, the condition of the soil and the matter of obtaining labor may be regarded as favorable. Food-supplies are excellent.

Resuming once more, Mr. van Vuuren came to the following conclusion : First, there is some reason for mining in Celebes, as in the Verbeek mountains prospecting is easy, provided the electro-metallic process can be used for the ores and the rollers for working up the iron according to the methods drafted by Mr. Koomans can be established there.

The investigation into the possibility of working up the ores by electro-metallurgy ought to be carried out in Holland where a staff of scientific men and extensive laboratories exist so plentifully.

Secondly, the working of the lime by judicious planning and by the use of water-power will give fresh impetus to the nitrogen business which will not be exclusively limited to that particular manufacture ; but there must also be a thorough grasp with regard to the working up of ores by electro-metallurgy.

Thirdly, primitive methods have been employed hitherto by the population, but under the supervision of an experienced mining overseer their working of the inferior layers can be greatly improved.

Fourthly, only those coal-fields in the Maros-district which are necessary to the laying down of a tram-line there, are worth exploiting. The rest of the fields cannot at present be exploited with profit owing to transport difficulties.

Fifthly, with full appreciation of the work carried out individually by our mining engineers in India, it must be said, however, that the way in which it has been done is not altogether satisfactory. In the first place a distinction must be made between the researches made in India and those to be made outside the archipelago ; namely there must be co-operation between the scientific centres in the west and those practically developing the lands in the east. There must also be co-operation between the different government organizations on the spot, while more importance must be attached to the results obtained by private enterprise instead of the thwarting attitude adopted by the authorities hitherto.

Sixthly, with regard to the precious metals, brown coal and petroleum, Celebes would appear according to the latest reports to have no future as a mining country.

Lastly, in connection with the desired co-operation between the scientific centres in Europa and those doing the practical work of developing the lands in the east, Mr. van Vuuren himself accepts the idea, lately established and explained by this society, of tracing by the natural method of research into ores, in accordance with their physical properties.

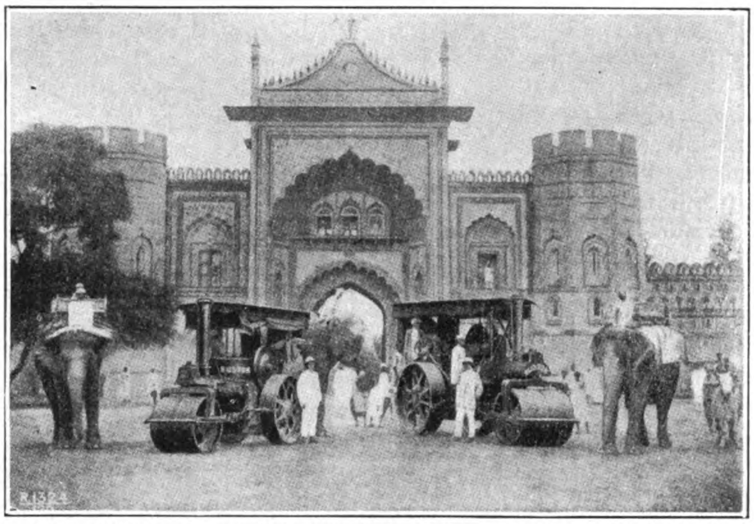
American Colleges for Oriental Women

Just at this time when the church and college women of the United States are in the midst of a campaign to raise $2,000,000 for the Women's Union Christian Colleges of the Orient in order to secure a gift of $1,000,000 offered conditionally by Mr. Rockefeller, the question is frequently asked what and where the colleges are, why they are needed, and by whom and how they came to be selected.

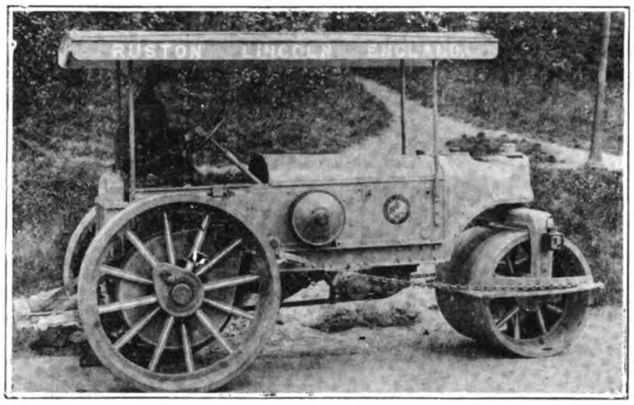
There are seven of the institutions, five colleges and two medical schools. They are the Woman's Christian College at Madras, India ; Ginling College at Nanking, China ; Isabella Thoburn, Lucknow, India ; Women's Medical School at Vellore, India ; Yenching College at Peking, China ; North China Medical, also at Peking, and the Woman's Christian College at Tokyo, Japan.

STEAM ROLLERS FOR CHINESE ROADS

WITH the construction of new roads throughout the country, the Chinese are turning more and more to the modern steam-roller and discarding the old stone or cement-filled iron cylinders hauled by gangs of coolies. Several orders for these machines have been placed in Shanghai for interior road work and the future holds bright for an increasing demand not only for rollers but other modern road-making machinery. Foremost amongst the manufacturers who have developed the road roller to its present high state of efficiency, stands the great British firm of engineers, Messrs. Ruston & Hornsby, Ltd., of Lincoln, England. This firm has met with great success in India, Dutch East Indies, Straits and other parts of Asia, and several of their machines are at work in China and many others in Japan.

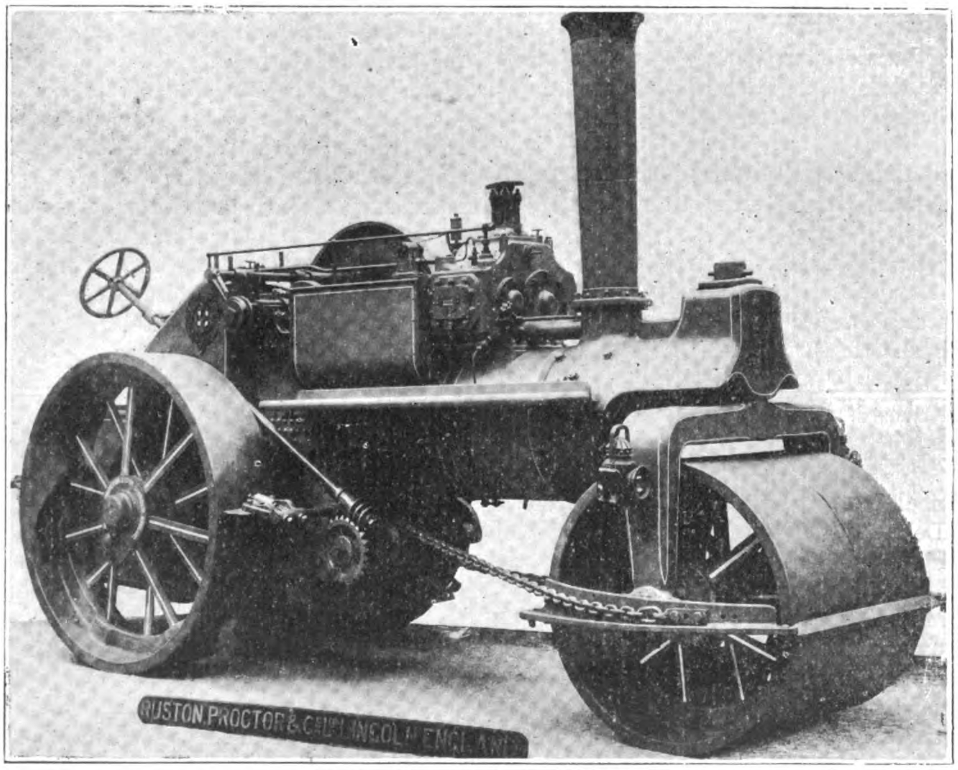


Ruston Rollers at the Entrance to the Palace of H.H. the Nawab of Ramphin, India.



The Ruston Motor Road Roller

Under all kinds of conditions and in all parts of the world the Ruston rollers are proving in actual use their economy, durability and all-round efficiency. They are made with either single or compound cylinders and in sizes from 5 to 18 tons. In addition to the well-known standard type, this firm makes the Ruston convertible, so built that by easily effected alterations it can be converted into a traction engine. These engines are of exceptional value to municipal authorities, estate owners and road builders, where a roller is not needed for constant use.



Ruston Compound Road Roller

One of their specialties is a motor roller, made in 6, 7, 8 and 9-ton sizes. They are of the three-wheel type, driven by a two-cylinder vertical paraffine engine placed longitudinally on the frame. They present a very smart appearance, are easily handled, with large wheels and have three speeds, viz., 2.5, 1 and ½ miles per hour.

The present firm of Ruston & Hornsby, Ltd., is the amalgamation of two old established engineering firms dating back to 1815, Ruston, Proctor & Company, Ltd., of Lincoln, and Richard Hornsby & Sons, Ltd., of Grantham, both pioneers in their lines. In the development of road rollers the name of Ruston has become famous throughout the world and won for its makers the highest awards in many international engineering exhibitions.

In the Ruston compound road roller is found the highest development of these machines. They are made in sizes ranging from 5 to 17 tons empty, rolling a surface of from 5-ft. 9-in. to 7-ft. 3½-in. These rollers are fitted with compound cylinders, the advantages of which are too well-known to need much mention. However, it is well to draw attention to the suitability of this system. In the first place the greater degree of expansion obtained, means that more work is got out of a given volume of steam than when it is only expanded in one cylinder, and therefore, there is a great saving of fuel and water. A further advantage is that owing to the low pressure at which the used steam exhausts into the atmosphere it does so with much less noise, which is a consideration when working in street traffic.

The cylinders are placed side by side with the cranks set at right angles. This eliminates the dead centre position of a single crank, and enables a start to be made on steep inclines by simply opening the throttle valve, and without reversing. In addition, the full pressure on the piston acts equally in all positions of the crankpin. Thus the engine works smoothly and without jar and an extra heavy flywheel is not necessary. An auxiliary valve is provided for admitting high-pressure steam direct into the low-pressure cylinder, giving greatly increased power for starting and climbing on very steep inclines.

Owing to the compound engine developing more power from the same amount of steam than a single-cylinder engine, the rate of fuel combustion is much slower than in the firebox of a single cylinder engine developing the same power, owing to the demand on the boiler not being so severe, consequently the firebox and boiler tubes of the compound road roller will last much longer than those of the single cylinder road roller.

大正七年七月十日第三種郵便物認可

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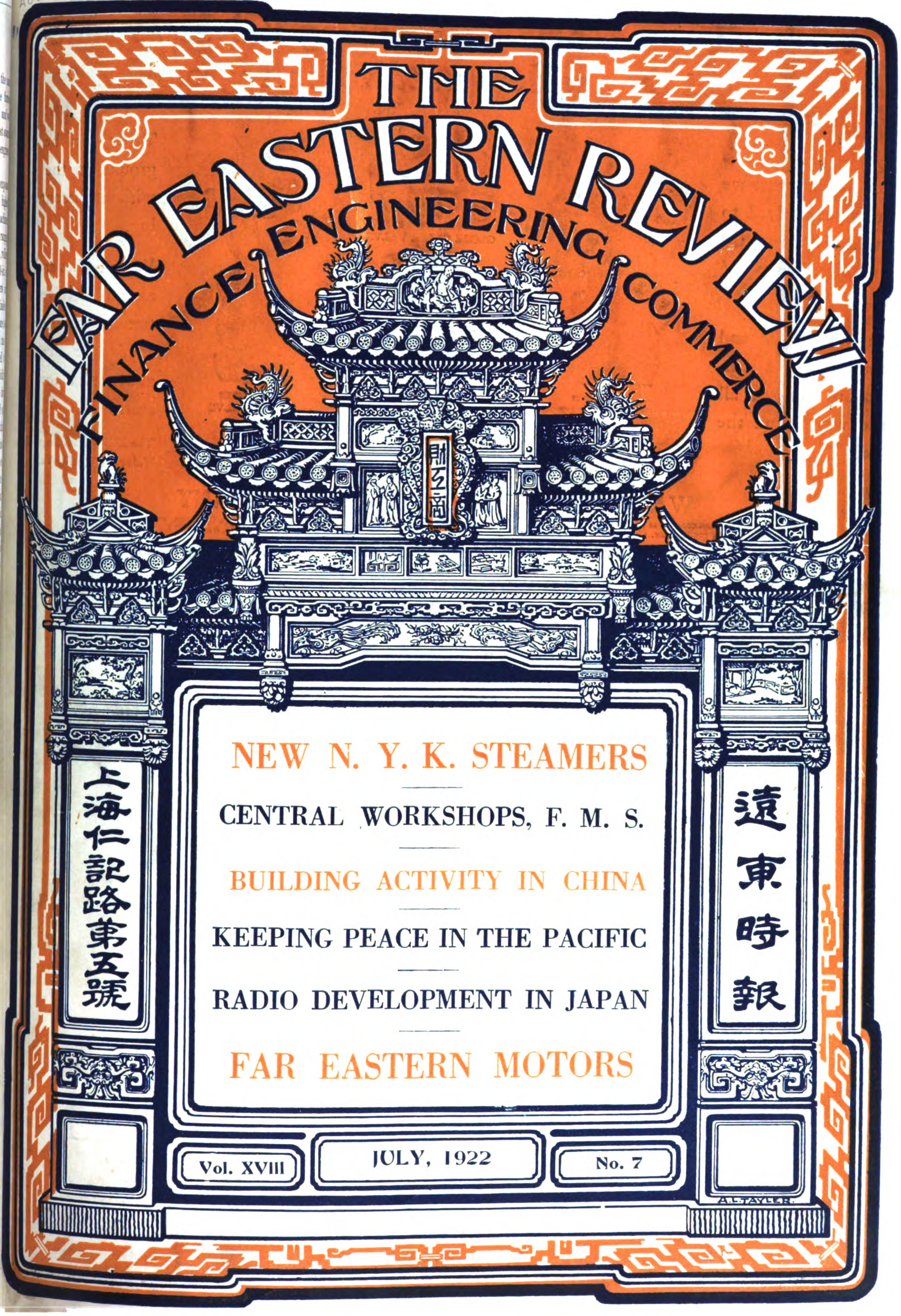

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High-Duty Metal is the best mixture we have yet evolved to combine strength, ductility, density and hardness.

Convex Discs and Seats insure a continuous contact all the way round the seat.

FIG. W3253
GLOBE CHECK VALVE

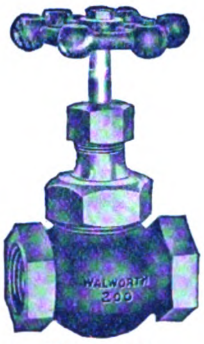

FIG. W3251
GLOBE VALVE

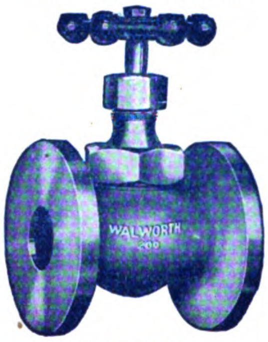

FIG. W3261
FLANGED GLOBE VALVE

FIG. W3252
ANGLE VALVE

They can be reground on the line without disconnecting.

Valve bodies and all assembled valves are tested with 400 lbs. Hydraulic Pressure above and below the seat.

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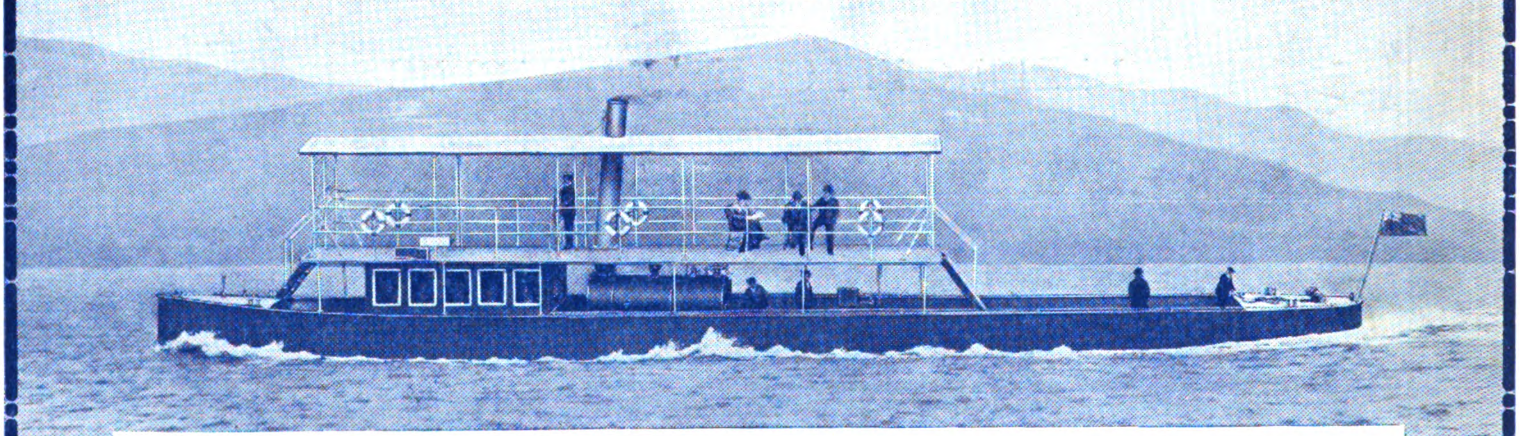


Length, 160-ft.; Beam, 24-ft. 6-in.; Draft, carrying 40 tons 2-ft. 3-in.; Speed, carrying 40 tons 15 Statute miles an hour, burning wood fuel only

Vessel as above illustrated can be shipped whole to any part of the world.

Messrs. YARROW Construct Fast Passenger and Commercial Vessels, Shallow Draught Steamers, Tugs, etc., propelled by Sternwheels, Side Wheels, or Screws working in Tunnels fitted with Yarrow's Patent Balanced Hinge Flap.

RIELLEY, SIMMONS & MILNE, Agents, Shanghai.

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, JULY, 1922 No. 7

New N. Y. K. Steamers

Keeping Ahead of the Procession

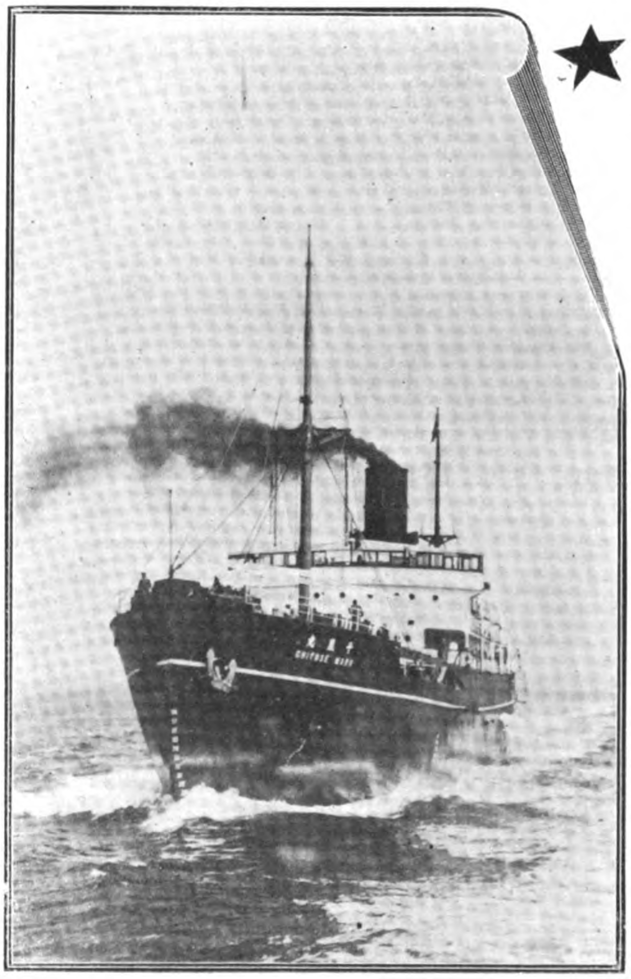
IN the keen competition for the first-class passenger traffic to and from the Orient, the Japanese do not intend to be outdone by their many rivals, and with each step forward on the part of other companies, the Nippon Yusen Kaisha keeps always abreast of the best, at times taking the lead in establishing standards for the well-being of its passengers which are most difficult for others to follow. While perhaps other companies may excel in the luxurious fittings and ornamentation of the saloons and staterooms of their crack steamships, the Japanese follow closely the artistic traditions of their own country. Cleanliness and comfort combined with the courtesy of attendance has won for their steamers a high place in the esteem of discriminating travelers.

Shanghai-Nagasaki Express Service

One of the greatest boons to the traveling public and general trade in the Far East will be the establishment of a rapid express service between China and Japan by frequent sailings of high-powered steamships specially constructed for the run between Shanghai and Nagasaki or Moji. The Japanese have long sensed the urgent necessity for such a service not only for the advancement of their own trade and mail facilities with China but for the general benefit of all residing and doing business in the Orient. To meet this demand the N.Y.K. is constructing two express steamers, the *Nagasaki Maru* and the *Shanghai Maru*. They are expected to be placed in operation some time this coming autumn and are now rapidly nearing completion in the Goven Yards of William Denny & Brothers, Ltd., of Dumbarton, Scotland. They will have a displacement of 6,150 tons (5,500 tons gross) with a length of 410-ft., width 54-ft., depth 32-ft., speed of 18½ knots and accommodation for 320 passengers.

Luxurious Accommodations

The steamers now employed on the Shanghai lines take about 48 hours for running the distance of 450 nautical miles between Moji and Shanghai, and about 36 hours between Nagasaki and Shanghai. The new steamers have been designed solely for the carriage of passengers, and will be completely equipped and furnished with the utmost regard for the safety and comfort of passengers during the voyage. The crossing will be made in about ten hours less than the time taken by other liners. In other words, if the steamer sails from Nagasaki at 10 a.m., it will reach Shanghai at about 1 p.m. the following day. Special consideration will also be given to scheduling the departures and arrivals of the steamers so as to facilitate connections with the railways in Japan and China. When these plans are put into effect, travelers between points in Japan and Shanghai, or *vice versâ*, can economize time to a considerable extent, with similar facility and advantage for passengers between Japan and interior points of China.



The "Chitose Maru"

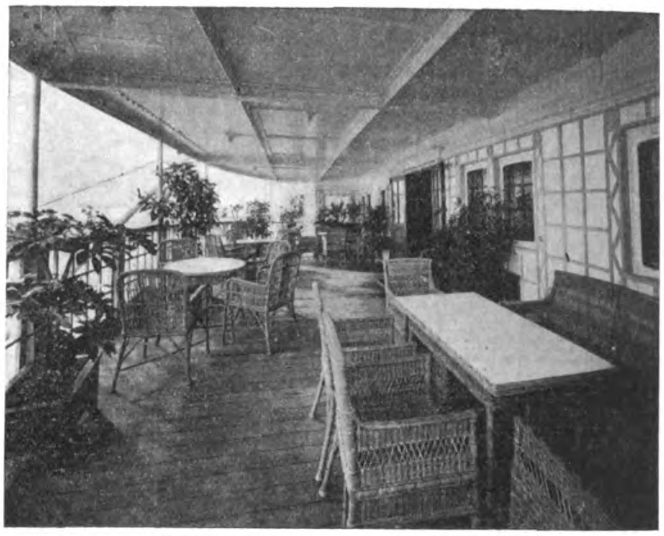
2,700 tons gross, speed 12 knots, 2,000 H.P. Built by the Yokohama Dockyard for the Hokkaido-Saghalien service of the N.Y.K.

The new steamers having been planned principally for the conveyance of passengers, the utmost attention and consideration is being given to their construction and furnishing, so as to ensure the maximum of safety, comfort and convenience. They will be equipped with magnificent social halls, dining saloons and smoking rooms, as well as inquiry offices, verandah cafés, bars and promenade spaces, with ample provision for the recreation and exercise of passengers. The steamers will carry only first and third-class passengers. The first-class cabin accommodation will consist of special staterooms, single, double and four berth cabins, etc., with different rates for each kind of room, thus offering a wide choice of accommodation to passengers. Now about the third-class accommodation. Heretofore accommodation for the third-class passengers on any steamer has been far from satisfactory. But the N.Y.K. took the initiative in improving it and has already effected considerable improvements on most of its steamers, thereby gaining the approbation of the traveling public. The improvements to be introduced in the new Shanghai liners are still more remarkable. Minute attention will be paid to the enlargement of space, efficient ventilation and lighting, complete sanitary arrangements of the rooms, etc. Independent dining, smoking and bar rooms of European style will be provided, in addition to a public

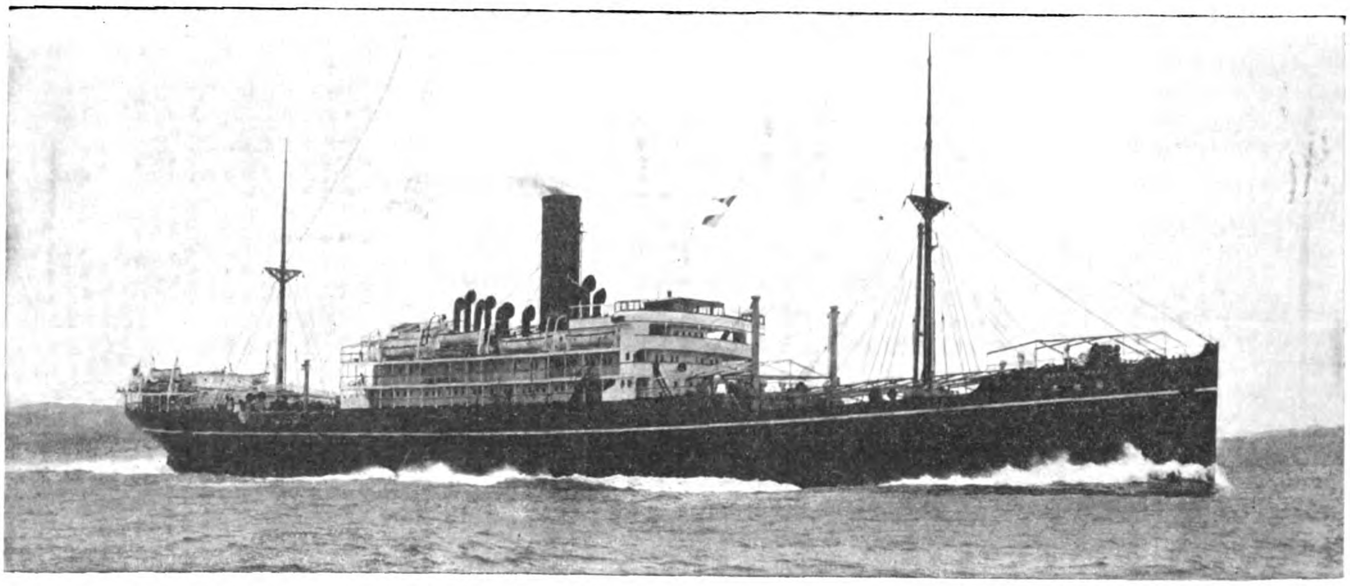
NEW N. Y. K. STEAMERS

VIEWS OF THE "HAKONE MARU" THE FIRST OF THREE NEW STEAMERS FOR THE EUROPEAN SERVICE

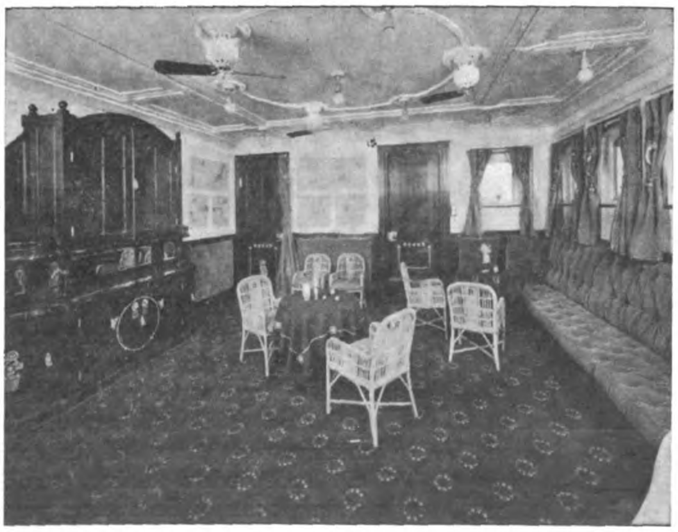
Dining Saloon



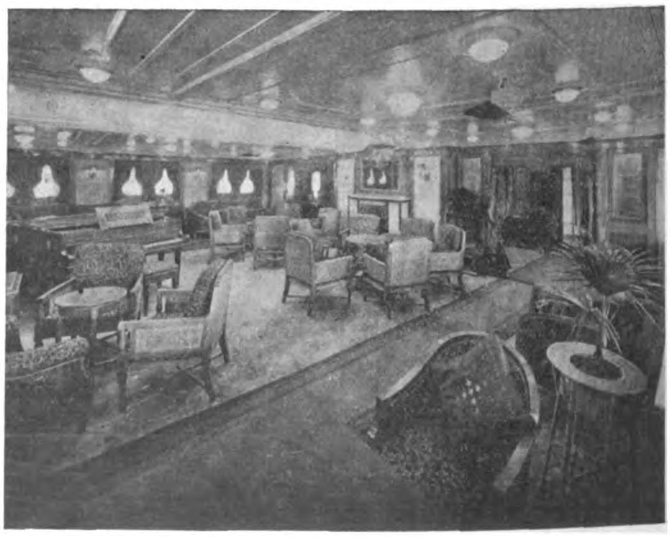
Verandah Cafe



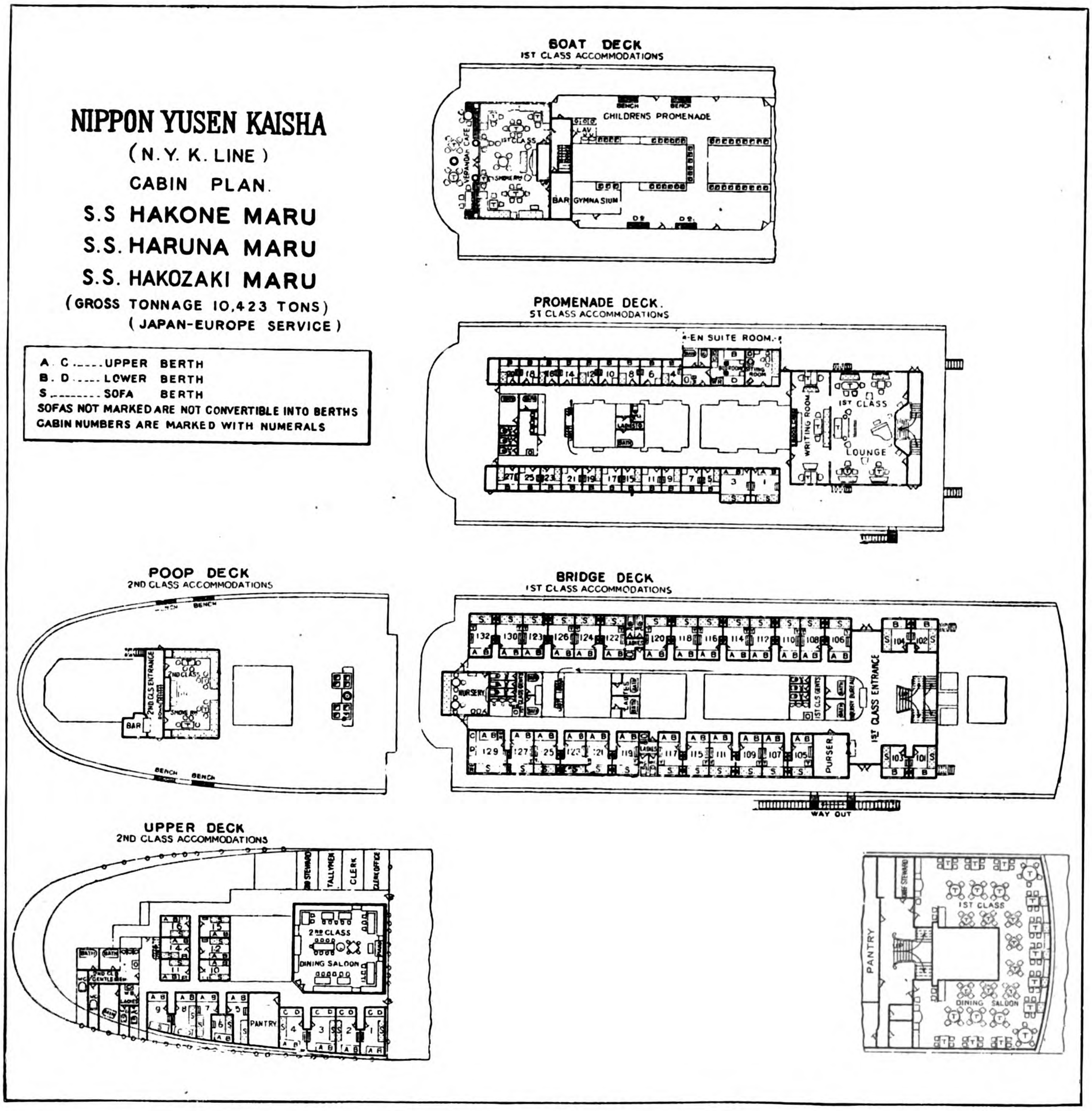
N. Y. K. Steamer "Hakone Maru," Built and Engined at the Nagasaki Works of the Mitsubishi Zosen Kaisha, Ltd.



Children's Nursery



Lounge



room with matted floor, supplied with chess boards and other means of amusement *à la Japonaise*. Needless to say, the lavatories and bath rooms are up-to-date and complete in equipment. In fine, the N.Y.K. confidently believe that the new fast steamers will give the traveling public entire satisfaction, and that the realization of the scheme will establish one more link to unite in friendly relations the countries of China and Japan.

New Hokkaido-Saghalien Steamer

Another of the forward steps taken by the N.Y.K. to facilitate Far Eastern travel has been the building of the *Chitose Maru* for the Hokkaido and Saghalien line. The placing of this steamer on the run in June last marked a new era in the opening up of these northern regions. Heretoforé, steamers plying between the Hokkaido and Saghalien were all inferior vessels of under 1,000 tons. The new steamer was built by the Yokohama Dockyard to a special design which brings her for all practical purposes into the ice-breaker class. In size, she is the largest in the northern service, being 2,700 tons gross, 300-ft. long and 43-ft. beam, developing about 2,000 horsepower and a speed of 12 knots, with a big reserve of power. She has accommodations for more than 450 passengers and being specially designed for this service is provided with heating system, wireless apparatus, ice-breaking arrangement and all modern conveniences conducive to the safety and comfort of the passengers and crew and the efficient handling of cargo.

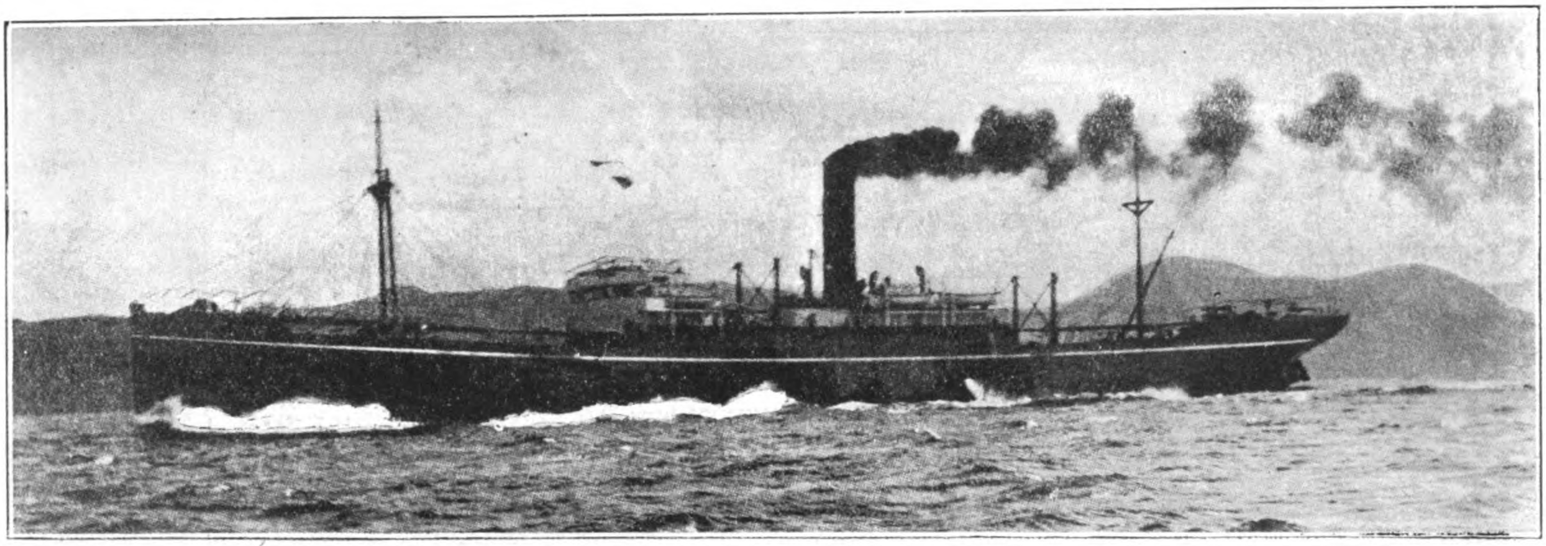
This comfortable steamer has naturally become the favorite for northern travel and shipments.

The engine room equipment of the *Chitose Maru* is as follows :

Main Engine—Single screw driven by a set of triple-expansion engines, cylinders, 23-in., 38-in., 64-in. dia. with common stroke of 48-in. Propeller of cast steel with four loose blades.

Boilers—200-lb. steam supplied from three 14-ft. dia. by 11-ft. 9½-in. long boilers. Parry's soot blowers are fitted to clean boiler tubes.

Engine Room Auxiliaries—Two Weir's main feed pumps ; one Weir's donkey feed pump ; one ballast pump ; one General service



The N.Y.K. T-class Geared Turbine Freighters "Toyooka Maru," "Toyama Maru" and "Toyohashi Maru," each of 10,000 tons Deadweight, specially designed for the European service. The first two ware built and engined by the Mitsubishi Dockyard and Engine Works at Nagasaki, and the last by the Kawasaki Dockyard Company at Kobe

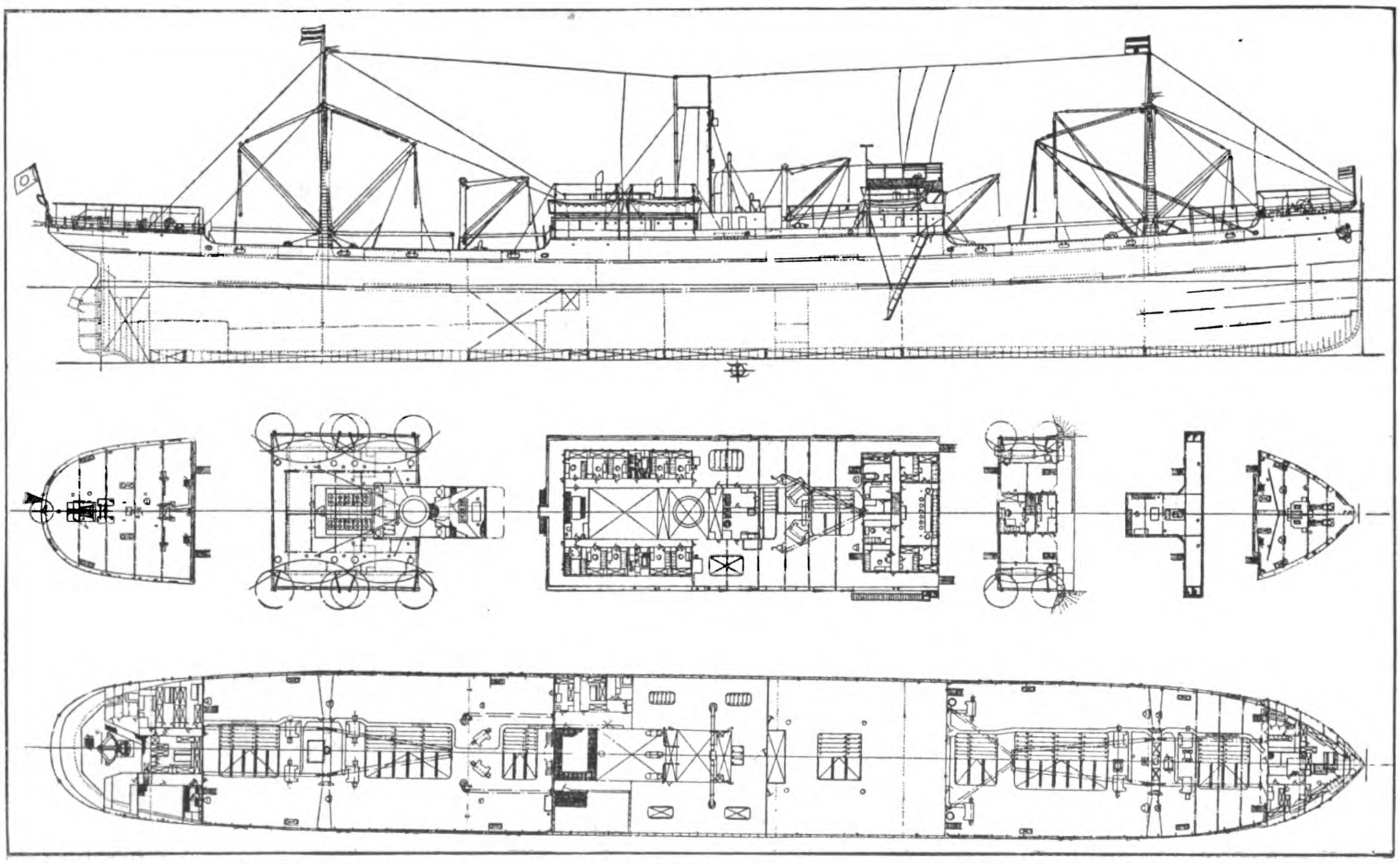
duplex pump; one centrifugal circulating pump; one forced draught fan engine; one 15 kw. dynamo engine; one Weir's feed water heater: one cascade feed water cleanser; one Prof. Shiba's patent auxiliary condenser.

Deck Machinery—One steam windlass; one steam steering engine; six horizontal steam winches.

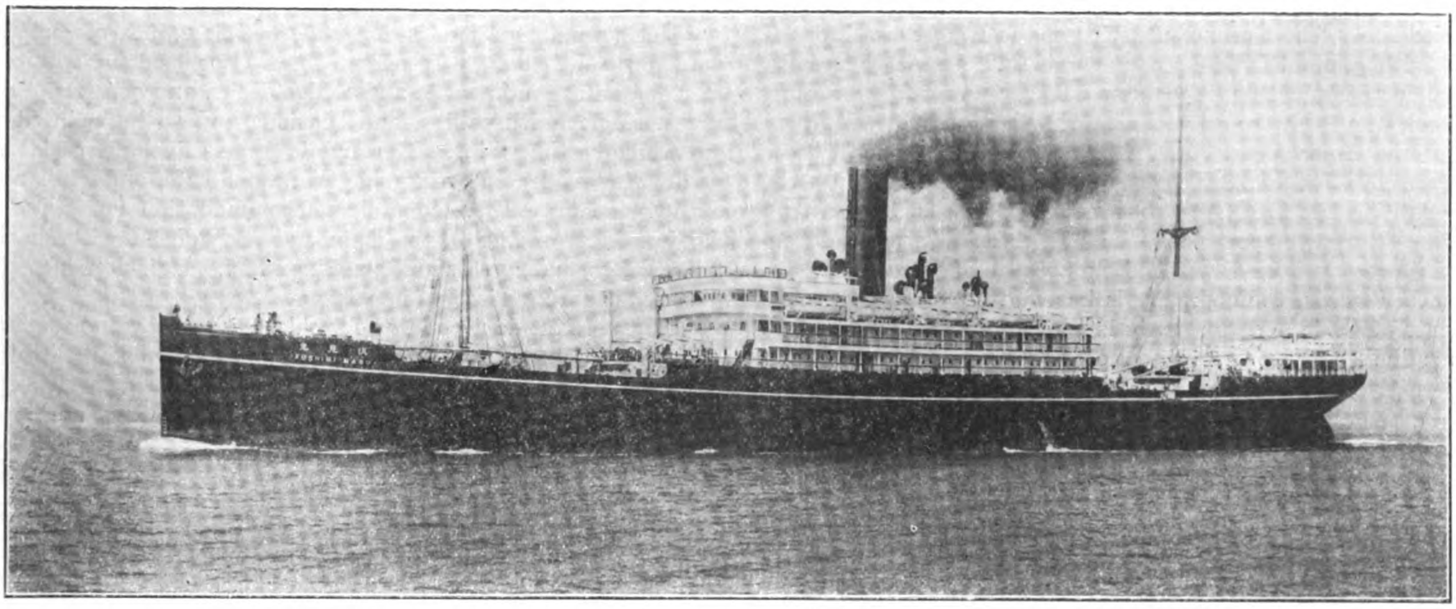
On the official sea trial she developed 4,000 I.H.P. at 93 r.p.m. and 15 knots speed.

European Service

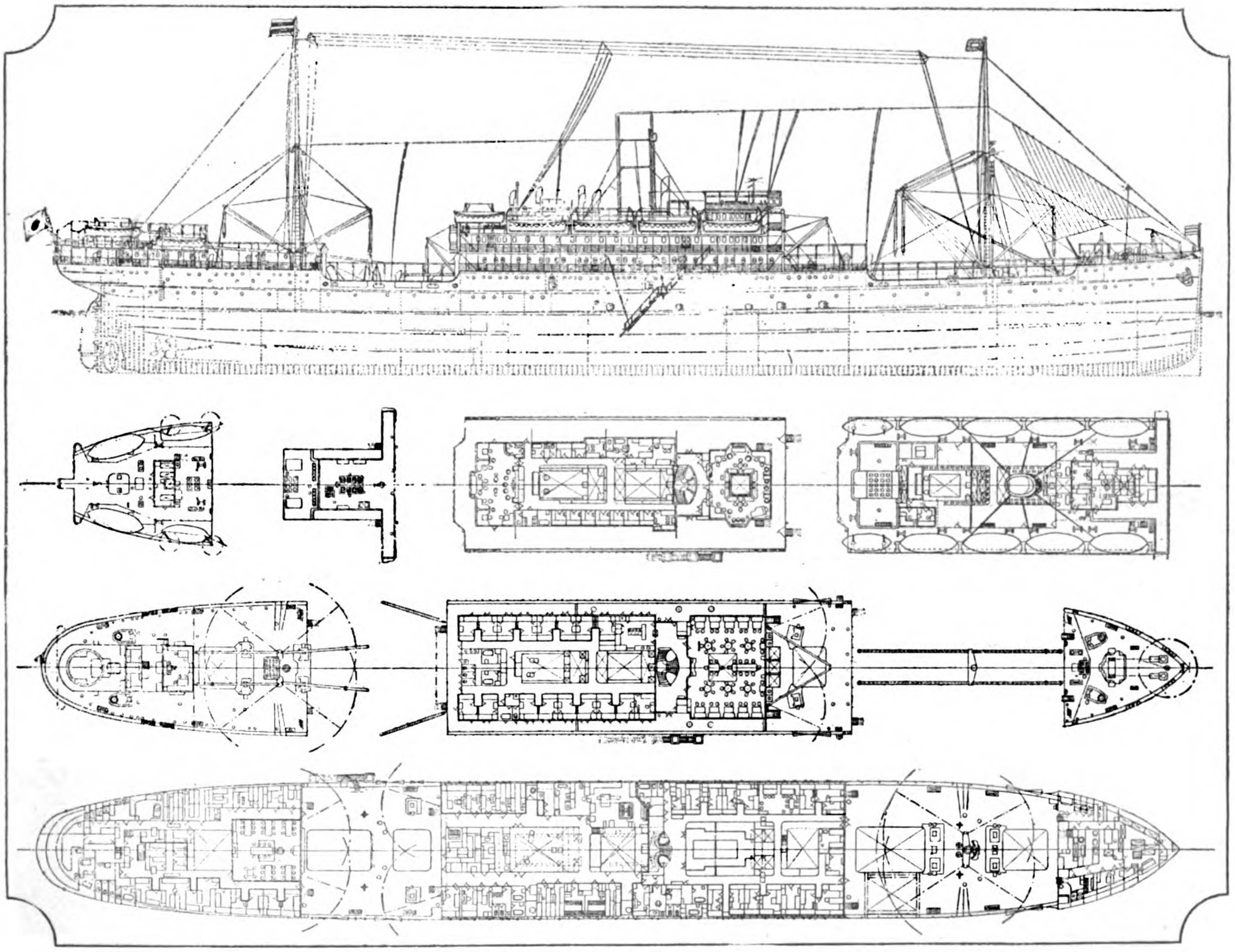
It is, however, in the new steamers for the European service that the N.Y.K. is demonstrating its efficiency. These steamers, the *Hirano Maru, Hakozaki Maru* and the *Haruna Maru* were built to replace the *Yasaka Maru, Miyazaki Maru* and the *Hirano Maru* lost during the war. The present tendency to forget events of only a few years back and criticize Japan ignores that in common with other Japanese companies, the N.Y.K. lost several steamers through enemy action, while running the gauntlet of the undersea terrors in the Mediterranean, Bay of Biscay and the Irish Channel, carrying food supplies and war materials to the allied armies. Critics overlook that the N.Y.K. carried its full share of the load imposed upon it and maintained a regular fortnightly European mail service during all the dark days of the war, and together with their escorts in the Japanese navy lived up to the highest traditions of those who instructed them in the art of modern seamanship. The spirit of the British navy and mercantile marine found its counterpart in the navy and mercantile marine of Japan. While the new European line steamships of the N.Y.K. cannot be compared to the larger ocean greyhounds in size, speed or luxury, past experience has taught that they are the most economical in the long 12,000-mile run from Japan to Europe loading at three ports and discharging



Plan of the N.Y.K. T-class 10,000-ton Geared Turbine Freighters built for the European Service



"Fushimi Maru"



"FUSHIMI MARU" CLASS OF N.Y.K. PASSENGER AND CARGO STEAMERS

PARTICULARS: 505′-0″ × 63′-6″ × 37′-6″ moulded; two deck type; 2 Triple-expansion engines; 7 Boilers 15′-6″ × 11′-9″ × 200-lbs. pressure; Water ballast 2,275 tons; Cubic capacity 595,240 cft.; Total bunkers 2,200 tons; 12 Steam winches; Gross tonnage 11,900 tons; Deadweight 12,000 tons; Speed 16¼ knots

PASSENGERS: 1st class, 121; 2nd class, 60; intermediate and 3rd class, 190

passengers and cargo in six or seven. Other points other than mere size had to be considered in the design of steamers on such a long and varied run. The European service of the N.Y.K. was opened in 1896 with a monthly service of cargo and passenger vessels, and then fortnightly as soon as new 6,000-ton vessels were built in England. In 1911, the original steamers were gradually replaced by six of the *Kamo Maru* class of 8,300 tons, and in 1913 these were superseded by five steamers of 10-12,000 tons. Besides the regular mail services the N.Y.K. has regular cargo services between the leading European ports and the Far East. During 1921 no less then 51 vessels were dispatched, an average of one a week.

In other words, the company is keeping abreast with the requirements of trade and the traveling public and its phenomenal success is due largely to the support of its friends in many lands.

The "Hakone Maru"

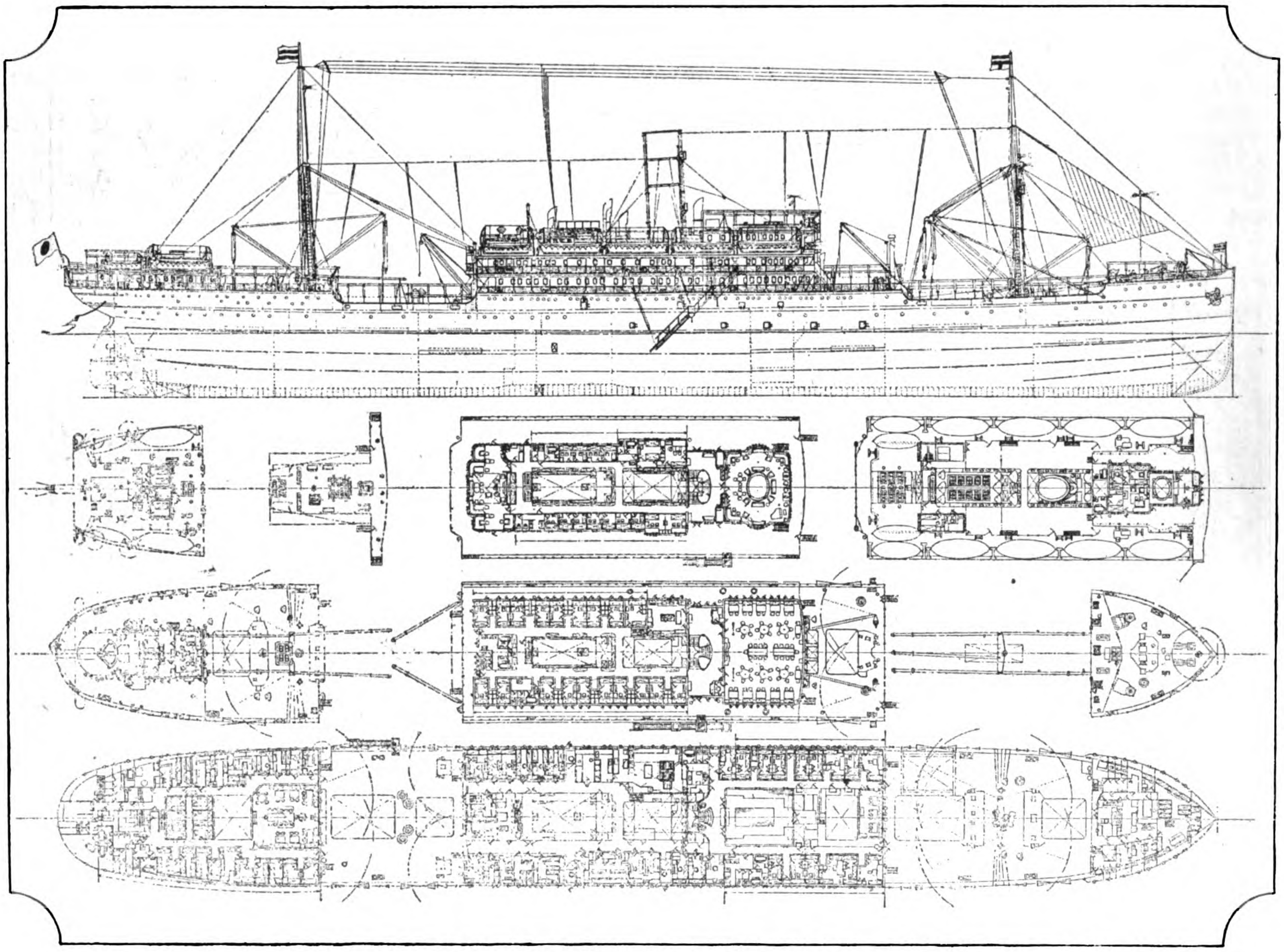
The three new vessels (of which the *Hakone Maru* was the first to be put on the run) have all been constructed at the Mitsubishi yards at Nagasaki to meet the requirements of the Japanese government and the highest class in Lloyd's register.

Launched on July 25 last, the dimensions of the *Hakone Maru* are: Gross tons, 10,422; dead weight, 10,861; displacement, 18,500; length, 495-ft.; breadth, 62-ft.; depth, 37-ft. The vessel has a double bottom throughout fitted for the carriage of oil in bulk, is divided into eight watertight compartments, is equipped with wireless, and the latest fire extinguishing apparatus and disinfecting appliances. The boat equipment is in excess of the board of trade requirements, all lifeboats being placed under davits.

Her accommodation is for 120 first-class, 56 second-class, and 180 third-class passengers. First-class accommodation is provided on the promenade and bridge decks, and consists of suite rooms, single berth cabins, and spacious and well-appointed two and three-berth cabins. The public rooms include social hall (or drawing room), smoking room, verandah café, children's room, and gymnasium. The second-class accommodation consists of two and four-berth rooms on the main and poop decks, with spacious dining saloon and comfortable smoking room. Hair-dressing saloon and laundry are available for passengers.

All the latest devices for the rapid handling of cargo are fitted, including 18 steel cargo derricks, one heavy derrick to lift forty tons, and 18 steam winches. The holds are spacious with extra large hatches, and have, as far as possible, been kept clear of obstruction to permit the loading of bulky cargo. A limited space is fitted with refrigerating machinery for the carriage of chilled or frozen produce. The propelling machinery consists of two sets of Parsons double reduction geared turbines constructed by the builders, steam being obtained from seven single-ended multitubular boilers, fitted with Howdens forced draught, designed to give a sea speed of 16 knots, which was exceeded on trials.

Whether forced by the competition of the larger and swifter U. S. shipping board and the new Canadian Pacific steamships on the transpacific run or merely as a return to pre-war conditions,



"KATORI MARU" CLASS OF N.Y.K. PASSENGER AND CARGO STEAMER

PARTICULARS: 490'-0 × 61'-0" × 36'-6" moulded; Combined reciprocating and turbine engines; 6 Boilers, 15'-6" × 11'-9" × 200-lbs. pressure; Water ballast 2,072 tons; Cubic capacity 595,240 cft.; Total bunkers 1,900 tons; 12 Winches; Gross tonnage 10,600 tons: Total Deadweight 10,900 tons; speed 16½ knots.

PASSENGERS: 1st class, 112; 2nd class, 56; European steerage, 178; 3rd and intermediate class, 8

the N.Y.K. have now concentrated all their crack passenger vessels on the European service. In addition to the three new boats above mentioned there are now on this run the *Fushimi Maru*, 10,928 gross tons, *Suwa Maru*, 10,672, *Kashima Maru*, 9,908, and the *Katori Maru* of 9,847 gross tons or seven 10,000-ton passenger steamers and four of the 8,000-ton class, viz., the *Atsuta*, *Kitano*, *Kamo* and the *Mishima Maru*, a total of eleven first-class mail and passenger steamers maintaining a regular fortnightly service between Yokohama, Marseilles, London, Antwerp by way of the usual intermediate ports.

N.Y.K. Turbine Freighters

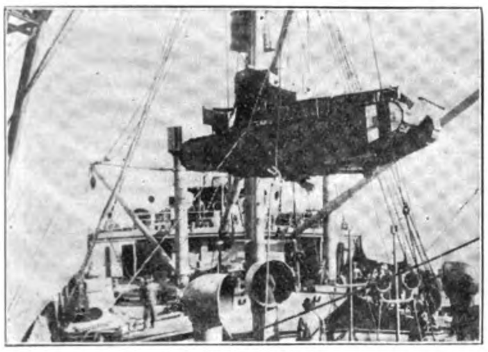
One of the features of the N.Y.K. European services is the special geared turbine cargo steamers of 10,000 tons deadweight capacity placed in operation soon after the outbreak of the war. Typical of this class are the *Toyooka Maru*, *Toyama Maru* and the *Toyohashi Maru* known as the T-class cargo steamers.

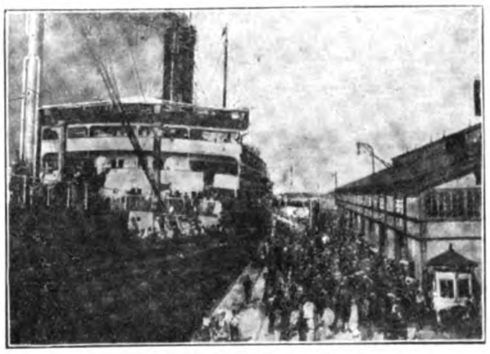
The first two boats have twin-screw geared turbines while the *Toyohashi Maru* has twin-screw triple-expansion engines with superheaters. The *Toyooka* and *Toyama Maru* were built and engined by the Mitsu Bishi Dockyard & Engineering Works, Nagasaki, and the *Toyohashi* by the Kawasaki Dockyard Company, Kobe. The *Toyooka* is of the following dimensions :—

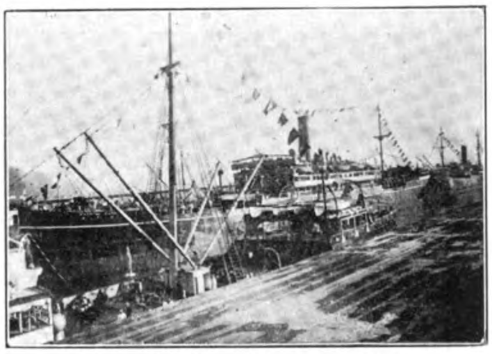
Length o.a.	463-ft. 6-in.
„ b.p.	445-ft.
Breadth, moulded	58-ft.
Depth, moulded to upper deck ..	34-ft.
„ „ to 2nd deck	23-ft. 9-in.
Maximum draft	26-ft. 8-in.
Gross tonnage	7,375 tons
Net tonnage	4,595 tons
Underdeck tonnage	6,574 tons
Deadweight carrying capacity	10,650 tons
Trial speed	14.54 knots at 9,650 tons displacement
Shaft horse-power	5,328
Height of 'tween deck	10-ft. 3-in.
„ „ bridge „	8-ft.
„ „ „ (clear)	7-ft. 3-in.
Depth of hold (clear)	20-ft. 1-in.
Height of 'tween deck (clear)	9-ft. 6-in.

The vessel, built to take the Teishinsho firstcl ass under the shipbuilding encouragement act and Lloyd's 100 A1 rating, is of full scantling type with erections, having a forecastle 34-ft., bridge 138-ft., and poop 35-ft. long. There are five holds with seven hatches, Nos. 2 and 5 holds having two hatches each. Fifteen steam winches made by the Mitsu Bishi Co., supply the cargo handling apparatus, together with 14 ordinary type derricks to lift 3, 6 and 10 tons, with a 30-ton heavy type of derrick at No. 2 hatch. The propelling machinery consists of two sets of Parsons' geared turbines to drive two lines of shafting. Each gear wheel is driven by a pair of turbines ; one, situated on the inboard side, is high-pressure, and the other on the outboard side is low-pressure. A reversing turbine is fitted in the exhaust casing of the low-pressure turbine. Each turbine shaft is connected to a driving pinion by means of a flexible coupling. The pinion is geared to a wheel, which is directly coupled with the propeller shaft. The gear ratio is 21 to 1. The turbines are of Parsons' improved type. The ahead turbine is of reaction and the astern turbine of impulse reaction type. They are designed for the working pressure of 200-lb., and for the maximum revolution of the main shaft at 120 r.p.m. The sizes are as follows :

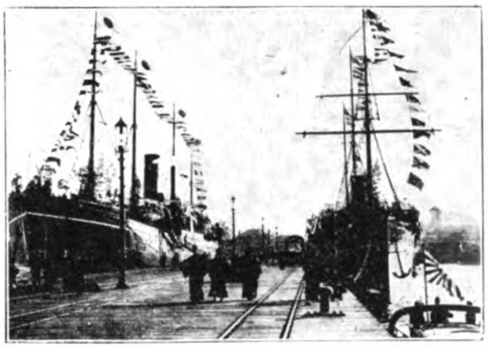
	H.P.	L.P.	Astern
Diam. and length	1-ft. 2½-in. x 4-ft. 10½-in. 1-ft. 11-in. x 2 ft. 5⅛-in.	2-ft. 6-in. x 3-ft. 4-in.	1-ft. 11-in. x 1-ft. 11¼-in.

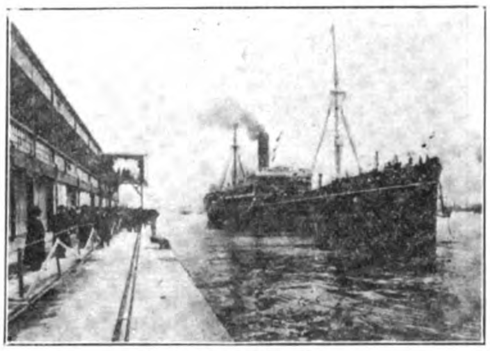

Landing a Tank


Dock at Yokohama


Great Northern Dock at Seattle

"Wakasa Maru"


"Tosa Maru"


"Tamba Maru"

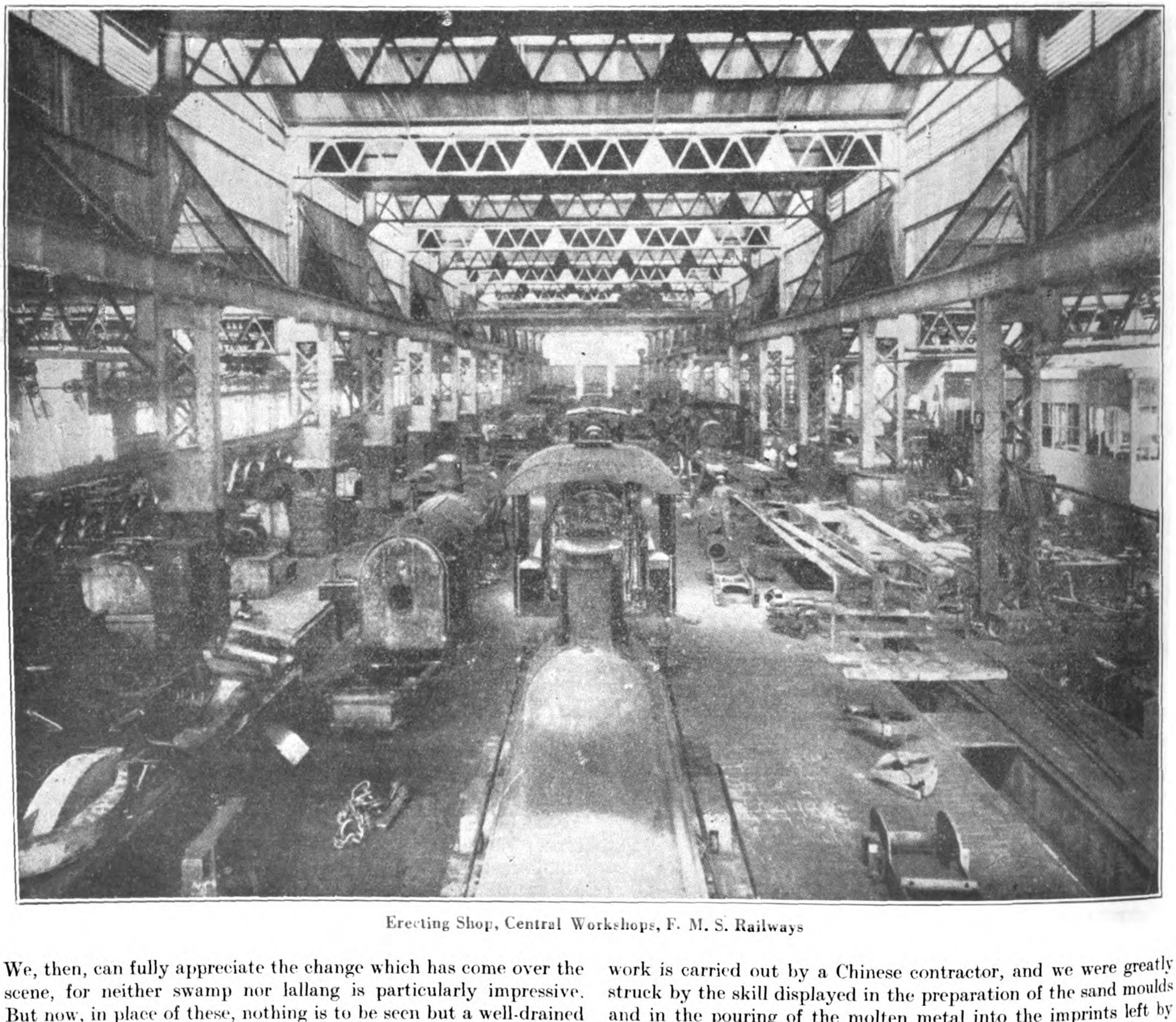
There are four single-ended Scotch boilers of 14-ft. 3-in. diam., 11-ft. 6-in. length, working at 200-lb., with Howden's forced draught. The oil pumps and oil-cooling pumps consist of three independent simplex pumps with complete oiling arrangements for turbines and gearings ; among them two are for ordinary working and one is for auxiliary purposes. There are two oil-cooling pumps of simplex-type. There are two main condensers and one auxiliary condenser of the non-vacuum type, having sufficient capacity to condense exhaust steam from windlass, winches and all auxiliary machinery. Other equipment includes two centrifugal pumps for circulating water, three feed pumps, feed water heater, cascade tank for feed water filtering, sanitary pumps, general service pump (duplex type), ballast pump (duplex type), two bilge pumps to each gear wheel casing, 40-ton Morrison evaporator, turning engine, turbine lifting gear complete, and two sets of kinetic air pumps, one of them being for reserve purpose. The dynamo of 15 kw. capacity is driven by a reciprocating engine. The propellers are four-bladed manganese bronze, of the built-up type, having a diameter of 14-ft. 3-in., and a pitch of 13-ft. 9-in.

The Central Workshops

Federated Malay States Railways

THOSE who have not actually paid a visit to the scene can have no idea to what extent the workshops connected with the F.M.S. railway system and situated just outside Kuala Lumpur, on the Batu Road, have developed within the past 17 years, despite the fact that a quarter of that period was occupied by such a crisis in the world as almost to cut the works off from the supply of material essential for upkeep and carrying on.

Prior to 1904 the site of the Central workshops was occupied by swamp, lallang and native quarters, and we well remember visiting the scene at about 6.30 one evening, at which late hour Chinese on contract were working trolleys on earthwork at a run.



Erecting Shop, Central Workshops, F. M. S. Railways

We, then, can fully appreciate the change which has come over the scene, for neither swamp nor lallang is particularly impressive. But now, in place of these, nothing is to be seen but a well-drained area containing a large array of vast buildings, an excellent residential quarter, and well-laid out recreation grounds. But perhaps a better idea of the rapid progress made may be gathered if we mention that in 1907 the actual shop area was 21,000 square yards, whereas in 1921 it has grown to 61,000. The area of the total workshop site and surroundings is 206 acres. Included in this area are a 9-hole golf course, a bowling green, and four tennis courts (three hard and one grass.)

The offices are contained in a well-built, roomy and airy block of buildings, which has had to be added to largely to keep pace with the increases necessitated by the growth of the works. The staff there numbers about 50.

Iron and Brass Foundry

The first shop we entered was the iron and brass foundry, where all castings for the railway are made. The whole of the work is carried out by a Chinese contractor, and we were greatly struck by the skill displayed in the preparation of the sand moulds and in the pouring of the molten metal into the imprints left by the removal of the wooden pattern. In the brass foundry we saw the application to brass castings of anti-friction metal, a practise universally adopted to obtain a smoother bearing surface for the axle boxes of rolling stock. In addition to their own work the railway department supply the public works department with

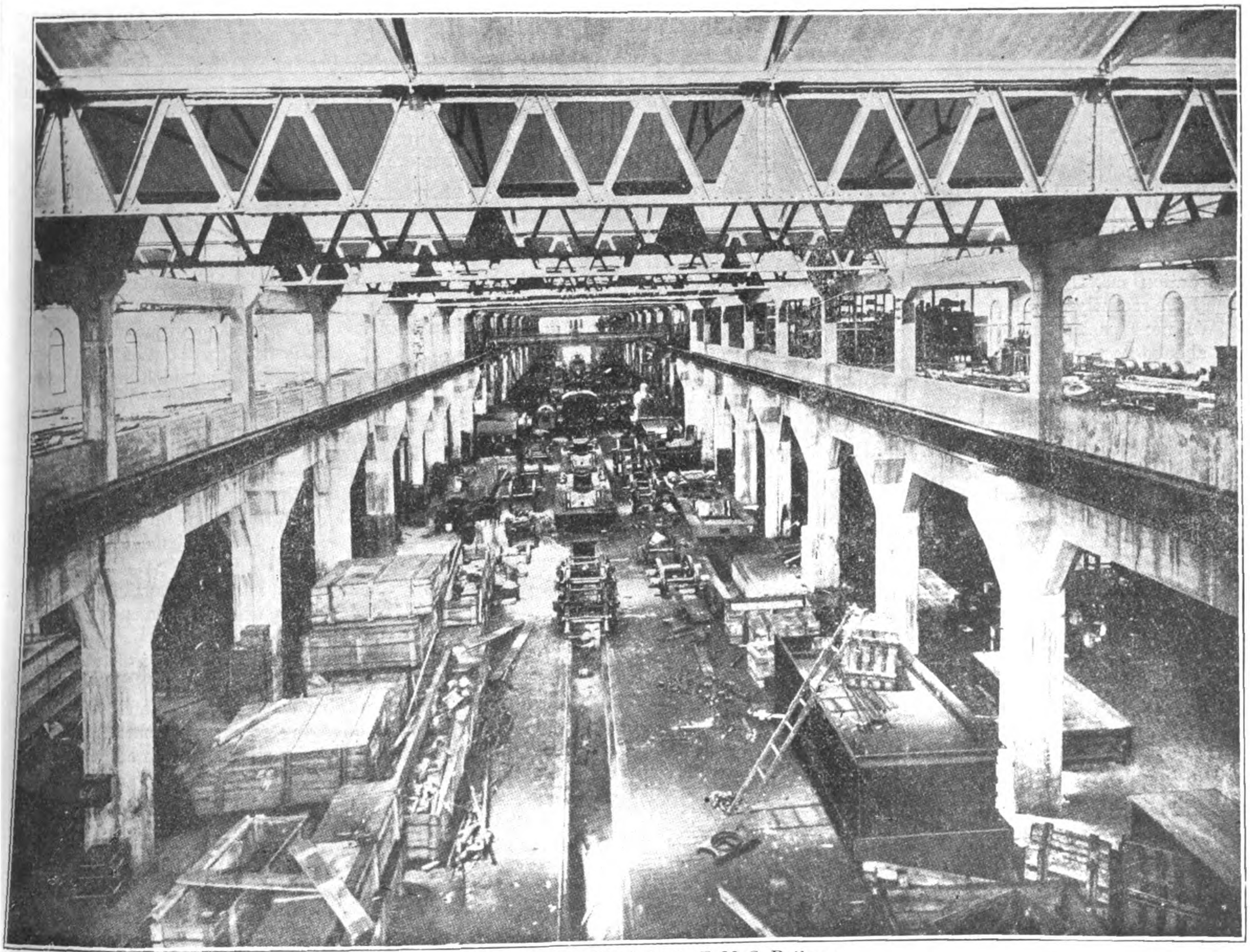
castings. In 1921 the output from the foundry was over 500 tons. Castings of five tons in weight can be made.

The adjoining pattern shop is also interesting, for there much care and skill are employed in making the patterns ; while in the upper region of this building is still preserved the old pattern used in casting the memorial tablet placed on the Victoria Bridge at Enggor when it was opened at the linking up of the old Perak and Selangor railway systems.

Passing on, we come to the electrical power-house where one-third of the power required in the work is generated, the remainder being obtained from the Ulu Gombak works. The fuel used in generating is the local Rawang coal, which, it is said, is excellent for the purpose. In this shed, which is kept in spotless order, power can be reduced from 5,000 volts to 400. A group of compressors close by saw previous service at the time of the construction of the Perak Pass tunnels. Not far from this building stands another one of very large size which is a branch of the stores department for the whole railway system. It is on this department that the works have to draw for supplies, these being indented for in bulk from the general stores of which Mr. Stones is in change.

We next come to a building which was used for building motor vehicles at the time when the railway department was running them ; but now it has been turned into a general utility shop. There; amongst other matters, lamp-making and repairing are carried on , and it is typical of the economical working so noticeable throughont the whole institution, that the old and familiar stand-by of the East, the kerosene-oil tin, is brought into service.

The next shop visited was originally intended for a waggon shop ; but it was never big enough for the purpose ; and now it is being used as a store for materials for the building of waggons, a large amount of which is awaiting use as soon as an improvement takes place in trade. Passing out of this building, we came to a broad open track which runs right through the works. In length it is 900 feet, and is known as the " traverser." There, a traveling table on rails is worked by overhead electric power. There are two sets of these rails, and the concrete bed in between forms the main drain and also a road which can be used by the fire-engine attached to the works. Adjoining this is the fine building used for the construction of the railway carriage bodies and concerning this we heard a good story about a past member of the railway staff, who, in his enthusiasm for horse-flesh, suggested that the building in question might be usefully employed as a hippodrome. Its length is about 400 feet. At one end is the saw mill, where we saw some very fine machinery employed in various way in cutting up and shaping the woodwork required.



Erecting Shop, Central Workshops, F. M. S. Railways

The railway department might almost be considered the pioneers in the use of Malayan timbers. A few years ago teak, chengal, rasak, merabau, meranti and serayah were alone in use but to-day, on the advice of the forest department, such comparatively unknown timbers as ballau, kapur, keruing, kulim, petaling are in addition being freely worked, and teak has been almost entirely eliminated.

In these construction sheds we saw the body being built of a tramcar which is to be run in Penang in connection with the Hill

Railway. We may here state, by the way, that the railway department does not make the under-frames of the carriages, but usually obtains them from home; though, during the war, in 1917-18 emergency orders had to be placed in Canada and Japan.

The next place visited was the boiler shop. This is devoted to repairs, which often are very heavy. Bridge and boiler construction work could be and has been, undertaken here; but, as the plates have to be obtained from home it has been found expedient to import boilers complete. The shed has just been extended 200 feet, and is now about 4000 feet in length. Near this, again, is a new waggon shop of 400 feet length. It was originally intended to make this 600 feet but it was found advisable to curtail the size for the time being. This shed, which is not quite finished, contains two bays, each 50 feet wide. Each bay will contain a 15-ton crane running up and down the entire length. The pillars have been constructed of reinforced concrete, as steel has been so high in cost and so difficult to procure.

Labor-saving Devices

Next we come to the blacksmith's shop covered by the roof of the old Kuala Lumpur railway station. Here are several steam hammers, one of the largest of which was built in the works.

In this department new springs for rolling stock are turned out and old ones are repaired, tested and brought into re-use. Here as elsewhere we saw a considerable amount of valuable and labor-saving machinery. which we are not competent to describe, but mention may be made of two machines for making bolts which have recently been installed.

We next passed on to an other carriage shop. This was built about two years ago and is 660 feet in length, with two bays, each 50 feet wide and equipped with 15-ton cranes. This huge shed is devoted to the work of fitting and repairing carriages. Everywhere we went we found the work most interesting but it was especially so in this department. For instance, one of the first things brought to our notice were some carriages that are being fitted up for the paymaster of the railways. These are going to be formed into two trains, each of three carriages. These are regular miniature banks on wheels, designed for paying wages over the whole system with speed and safety. The applicant for pay receives it through a window protected by expanded metal; and as there are several of these windows to each carriage the process of paying out can be carried out rapidly in comfort and safety. Near by this, we came upon a new type of car which, we understand, was exhibited at the Malaya-Borneo exhibition at Singapore. It is an interesting vehicle embodying the very latest ideas of ease and comfort in railway traveling. To achieve this, the central idea is, of course, a bar compartment, where cold tiffins or tea can be obtained; in fact in this one carriage are combined all the comforts of the usual first class, together with facilities for the seating of four people in comfort at a table large enough for the playing of card games. This accommodation is provided both in that part of the car which contained the bar and also in what we may call the ordinary part. This has been found possible by building the sides of the carriage on a new principle, namely, what is described as bent sides, i.e., the sides, instead of being perpendicular, bulge outwards. Similar coaches are now running to Malacca and on the Singapore section. Fans are provided throughout these cars.

In reply to a question we were informed that carriages required to be renovated and re-varnished in from 18 months to 2 years' time.

Innovations on Trains

Other matters of interest that we saw were the following. A cupboard with doors opening outwards was fitted in the side of a guards van. This is for the use of the carriage-examiner, who when he needs grease, will now be able to obtain it without plastering the said material over the floor of the van, or, possibly, over luggage. We next saw a room where the electric fittings of the carriages are regraded and in which materials for electric lighting are kept. We were told that some six to eight stations had been fitted up by the department with small lighting sets, though whether with entire success it is too early yet to say. Passing on, we came to a room devoted to upholstering work for the carriages, and there among other things we saw some ratan seats for the second class which, we were told, were made in England. Needless to say, the management has long since started to make ratan seating in the workshops.

Across the railway line is the engineering depot, which is under the charge of the engineer for ways and works, Mr. R. W. Haim. This, owing to pressure of time, we were unable to visit; but on our way back we passed through the erecting shop, a building now 600 feet long, and containing three bays, the central one being 45 feet wide, and those at the sides, 40 feet. Two 20-ton cranes are in operation here, while an electrical shop is installed upstairs. Though several times extended, this shed, we were told, is still too small, and the question of building a new shed on a new plan is under consideration. The machinery in this section is very fine, especially the numerous lathes. Among the many items of interest is a hydraulic press with a pressure of 200 tons. By means of this, wheels are put on the axles at about 70 tons pressure. The system of group driving by means of electric motors is adopted in this shed, but the bigger machines are individually driven. Turret lathes—so much in use at home during the war—are among those installed in this department.

In reply to a question as to whether the workshops turned out any work for war purposes we were informed that our authorities had offered to make huts which could be shipped in sections ready for speedy erection but the offer had been declined. This seems a pity for we could have turned out this, at one time much needed work, rapidly and cheaply. Munition work was out of the question here owing to the fact that the material would have had to be brought in and shipping was scarce.

Staff and Hours

The staff employed in this great undertaking varies from 1,300 to 1,400 all told. The working hours for the laborers are: 6.30 a.m. to 11 a.m.; 12.30 noon to 4 p.m. on ordinary days, on Saturdays 6.30 a.m. to 12 noon. Pay is given for 8 hours on Saturdays when the workman has not been absent during the remainder of the week. Instruments known as recorders showing the time of the arrival and departure of the workmen are installed in the works.

Before leaving, we went to seen the railway institute a commodious building of nice design erected alongside the recreation ground. This building contains a fine reading and refreshment room, a billiard room, a changing room, with the usual conveniences, a secretary's room and a store room. In addition to billiards, a ping pong table is provided. The Padang is big enough for cricket, football or hockey while two grass tennis courts and two Badminton courts are also maintained. The subscription to this club is a graduated one based on salary, and both the club and the adjoining playing field are deservedly popular, adding as they do to the pleasure and convenience of those who live near by.

To accommodate the senior staff, some 18 to 20 bungalows of good design have been built in a line on the far side from the works of the golf links, care having been taken to provide ample space in between. In fact it is very evident that in laying the site of what is now a little township, the greatest care has been taken to provide in every possible way for the welfare of the whole staff whether in the works or during their leisure hours.

In conclusion, we can only advise our readers to pay these great works and model township a visit, for we are unable in the course of an article to do them justice. For the rapid strides made and the success achieved, the greatest credit is due to Mr. P. A. Anthony, C.M.G., the general manager of our railways during the past 12 years, and to Mr. G. C. Forbes, the locomotive superintendent, who has charge of all the main portion of the undertaking, and who, coming to the F.M.S. in 1903 after 5½ years' railway service in India, started these works and developed them into what they are to-day—a monument of energy and enterprise under careful supervision and economical working.—*The Malay Weekly Mail.*

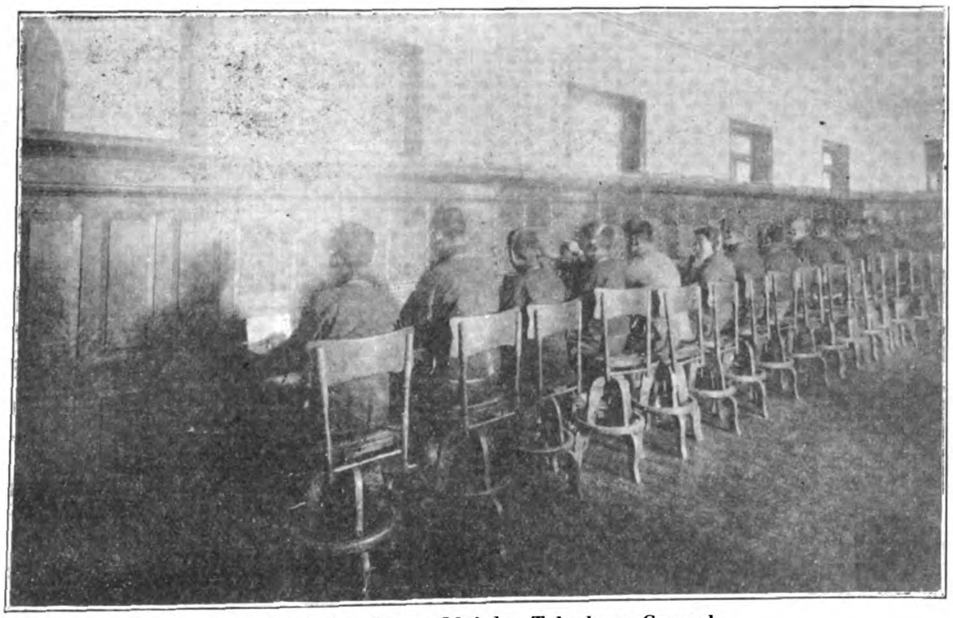
New Telephone System for Mukden

ONE of the largest Kellogg system-exchanges in the Far East is that of the Manchurian provincial government at Mukden. The first telephone exchange in Mukden, a local battery magneto system, was installed about 1910 with less than 200 subscribers; by 1918 this exchange had grown to its ultimate capacity, 800 stations. The equipment was in poor condition and the administration found it impossible to furnish satisfactory service.

In order to improve the service and, at the same time, to make possible further extensions to take care of over 100 merchants who were clamoring for telephones, the director of the administration requested several manufacturers to submit specifications and samples of their apparatus.

The Kellogg universal switchboard was selected as best meeting the requirements, and an order was placed with the Kellogg Switchboard & Supply Company, through their China Agents, Messrs. Andersen, Meyer & Company, for central office equipment having initial equipment for 2,200 lines, and an ultimate capacity for 3,200 lines.

It is possible to operate either magneto local battery, or common battery telephones in connection with the Kellogg universal switchboard. The Kellogg universal line circuit consists of a standard common battery lamp signal line circuit with the addition of an extra contact at the line relay. In order to change a line from magneto to common battery, it is only necessary to change one connection on the relay terminal. The changed circuit is then a standard common battery line circuit exactly the same as would be furnished in a straight common battery switchboard equipment. The connecting cord circuits automatically adapt themselves for connections from magneto to magneto; magneto to common battery; and common battery to common battery lines.



Operating Room, Mukden Telephone Central

The new Mukden exchange was placed in service during the summer of 1920. The 800 magneto local battery subscribers were connected with their old telephone sets to the new Kellogg universal switchboard. No change in the instruments was necessary.

At the time the new switchboard was placed in service, the administration announced that Kellogg common battery telephones would be installed for any subscribers who desired common battery service, upon the payment of a deposit, and at a small increase in the monthly rental. Immediately applications began pouring in for the Kellogg telephones, and within one year, the original 800 stations were changed to common battery, and 400 new subscribers were added to the exchange, making a total of 1,200 stations. By this time the line cables were filled to capacity. The administration recently placed orders for wire, cable and telephones, sufficient to take care of 500 additional subscribers.

The telephone administration erected a modern fire-proof one storey and basement building to house the central office equipment. All of the apparatus was installed on the ground floor. The terminals, relay racks, wire chief's desk, charging and ringing motor-generators, power panel, etc., are all in one room—conveniently arranged for maximum efficiency. The universal switchboard and chief operator's desk is in a large room on the same floor. Two sets of storage batteries are located in a dry and well-ventilated basement room. A gas-engine generator charging set is located in a basement room. This is furnished as an insurance factor against possible failure of the city power plant which regularly supplies current for operating the charging and ringing generator.

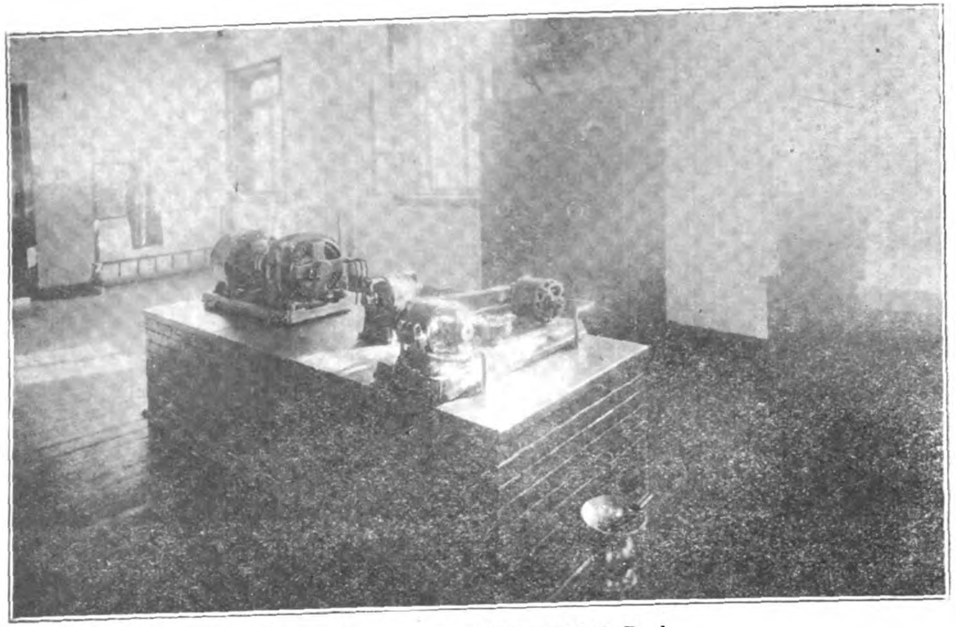
The line cables enter the office through a tunnel which connects the basement to a terminal house near the cable pole. All of the work of installing the equipment was performed by Chinese "Fitters" regularly employed by the administration. A glance at the accompanying illustrations is proof that they did their work well. The exchange has now been in service 18 months, in charge of the same Chinese foreman who operated the old magneto equipment. This man is not an engineer, and had no previous experience with common battery equipment. The Mukden telephone service is highly satisfactory to the subscribers, and one does not hear in Mukden the complaints that are voiced elsewhere in China.

GAS AND STEEL WORKS AT TSURUMI.—A gas plant and steel works will be started at Tsurumi soon, with a large daily output of steel and a daily capacity of 2,000,000 cubic feet of gas, according to the Japanese vernacular press. Mr. S. Asano, president of the Toyo Kisen Kaisha, has bought out the coke factory of Mr. T. Yamamoto, ship magnate of Kobe, and machinery for the new factory has already been contracted for.

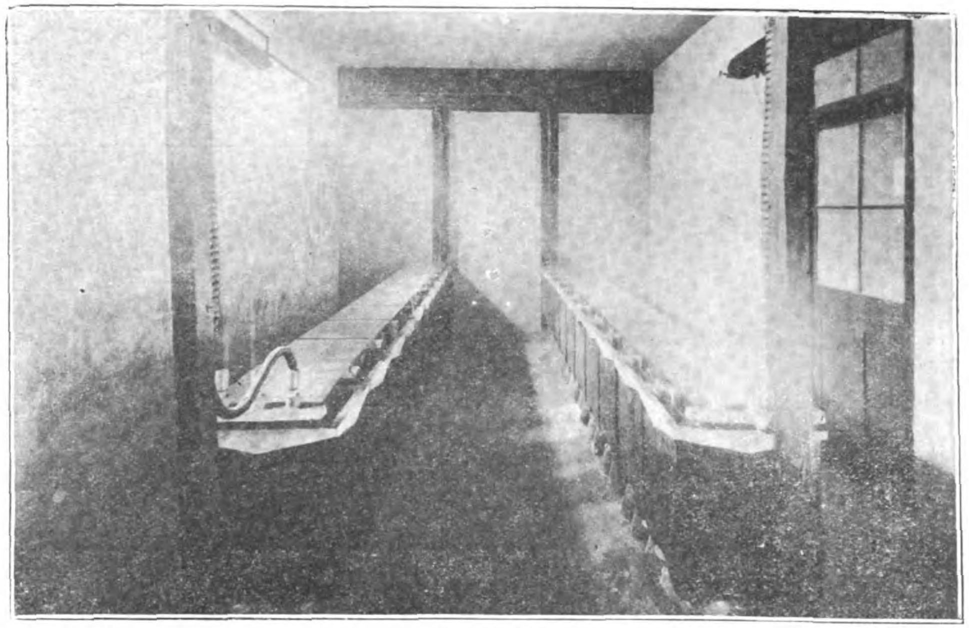
This factory will be one of the first of its kind in Japan where the manufacture of steel and gas will be combined. It is intimated that a contract has been made with a gas company in Tokyo to furnish illuminating gas from the Asano works.

SOUTH MANCHURIA SPINNING MILL, LTD.—Architects entrusted with the drawing up of a plan for the new spinning mill to be erected by the South Manchuria Spinning Mill, Ltd., have arrived at Fengtien (Mukden) from Japan. This Company has secured from the S.M.R. Co. the lease of a tract of land comprising about 15,000 *tsubo* on the west side of the railway track at Mukden, and proposes to begin building work in early July at the latest, to be finished by the end of October. The total cost is put at about Y.300,000. The new plant is expected to be opened to operation about May next year.

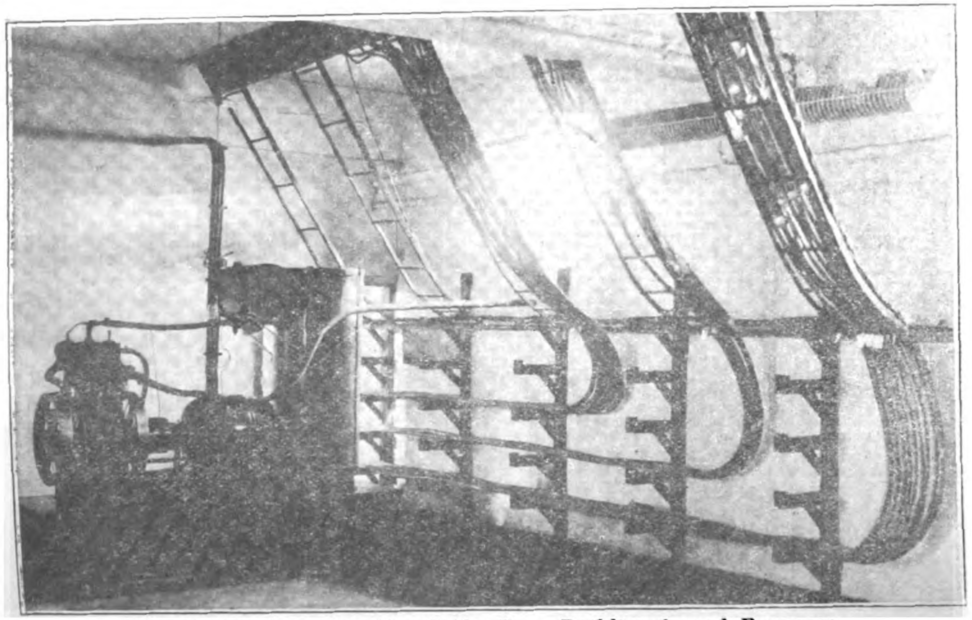
NEW KELLOGG UNIVERSAL SWITCHBOARD, 3,200 LINE INSTALLATION FOR THE MUKDEN TELEPHONE ADMINISTRATION



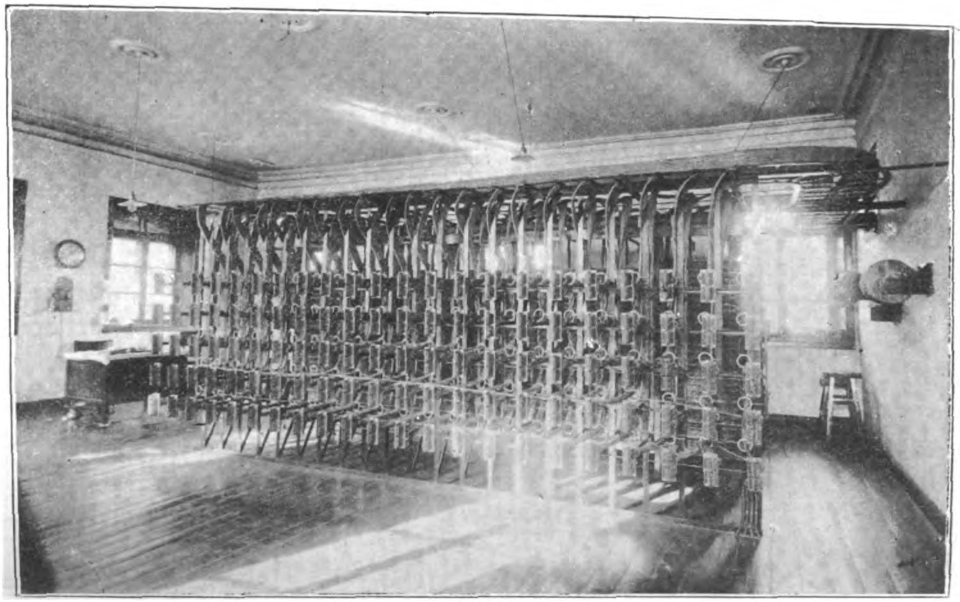
Power Apparatus and Wire Chief's Desk



Battery Room



Gas Engine Generator, Line Cables Enter Building through Basement



Kellogg—Terminal Room: 3,200 Line Equipment

Tayeh and Its Industries

China's Half-way Policy

THE Chinese have a saying "*pan tu erh fei*" which means "to go half the way and then fail to go further." Failing half-way is a common kind of failure in China. "This man began to build and was not able to finish" was said 1,900 years ago and is as true as ever, especially in this land. In this Tayeh region we seem to be accorded more than our share of this kind of thing. There is a place about 15 miles from here called Wangshanshih (facing mountain stone). It was prospected by no less than three engineers from Glasgow. A million dollars were spent by Chang Chih-tung over these preliminaries.

A little mining was done and the prospect was a fair one but somehow or other the enterprising spirit exhausted itself at that point and the scheme was abandoned. There is now only a big hole to show for the expense. There is a mountain about seven miles from here to which a light railway was constructed and mining begun. They say that mountain contains the "Wu Pao" (five precious metals), viz., gold, silver, copper, tin and lead.

About three years ago the mining ceased. The railway track still remained; we used often to walk along it. Pedestrians in abundance go along there. One would have thought it would pay to run trains for them and their loads. But no such idea seems to be in anyone's mind. Now within the last three months the rails have been taken up—transported, we are told, to Elephant's Nose mountain, the latest enterprise of the Hupeh government.

On my last journey I had some more instances of this kind of ineptitude. In the Hsingkuo (now called Yanghsien) county there is another light railway with no traffic on it. It was to convey copper-ore to the river side whence it could be transhipped to Futzukou where there is a copper foundry. I saw this place too. A few men are in charge of it but the Japanese manager was dismissed two years ago and there is now nothing doing.

I took a small steamer from there to Shihkweiyao. This we are given to understand is to be a port of considerable importance. It has been the river side terminal for 30 years for the railway to the iron mountain. There is always a Japanese steamer moored here ready to take iron-ore to Japan (or to a dump at Wuhu when the river is too low for big steamers). Japan gets this iron on special terms in payment of the Boxer indemnity. Other steamers tow lighters of ore up to the Hanyang Ironworks.

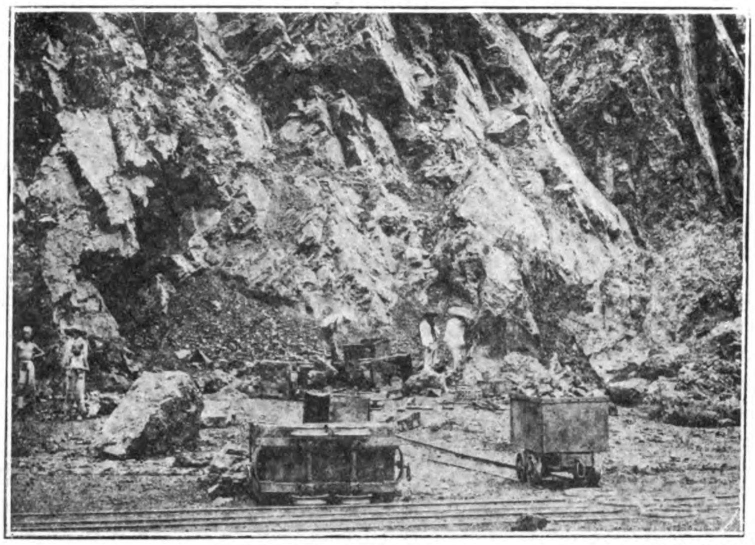
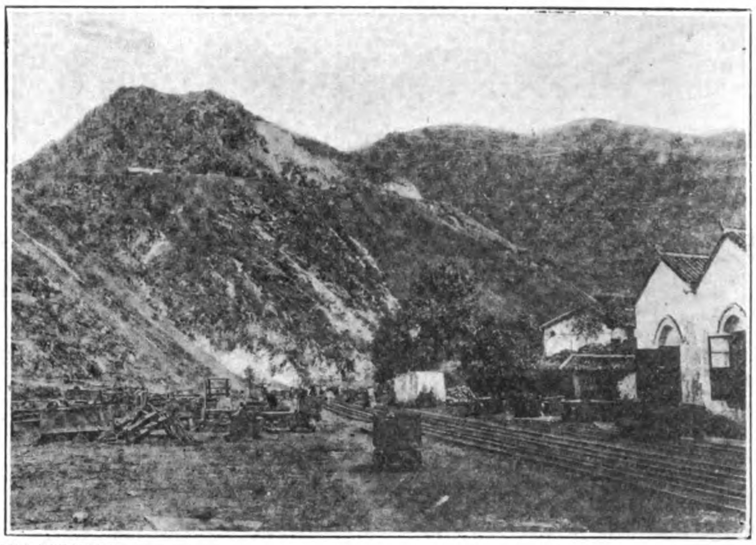
A few years ago a great enterprise was started just below Shihkweiyao. A huge plant has been collected and blast furnaces are to be opened there to relieve the pressure on Hanyang. The dates that I have heard given for opening the new furnaces are more numerous than I can remember. It is always a few months later. Meanwhile there is a model town with wide streets and rows of well-built houses of three qualities according to the grade of occupier. A bund has been made for some distance and is to be extended. A fine club house exists and is well patronised. Electric light is supplied to every house and water too.

TAYEH HARBOR

But the enterprise is halting. Not only has the first blast furnace still to be opened, which means that nothing has yet been produced to pay the promoters, but we hear of economies being effected in various ways. One of the two big mines is now closed and the trains run now to the other and newer one. The fine hospital which—quite rightly—was got ready in case of accidents had two foreign trained doctors. It now has only one. It looks as if the opening of those furnaces, in spite of a very large stock of coke which has been accumulated, is still a good while off.

A Line that Tells a Tale

Two or three years ago the Hupeh government opened a mine at Hsiangpishan (elephant's nose mountain). The railway runs alongside of the aforesaid Hanyehping line—sometimes 5 *li* apart,

TAYEH IRON MINES

sometimes almost touching. Yet they never quite touch. There could be no transfer of rolling stock from the one to the other. The construction of the line was a marvel of speed—only six months, I am told. The chief engineer was a Chinese educated in the U.S.A. He is now in Wuchang to answer a serious charge and the man below him has got his place. It sounds like a very old tale and no doubt went a long way towards making this undertaking, like the others, a non-paying concern. The terminus of this railway is nearer to Hwangshihkang than to Shihkweiyao.

Hwangshihkang has grown of late. A fine chamber of commerce fronts the river and near to it a new R. C. hospital. What no European can understand is why no decent road has yet been made connecting these two towns. They are only 10 *li* apart; yet there is only a footpath, winding and muddy, to bear the enormous traffic that passes along it on fine days. On wet days the traffic necessarily dwindles to almost nil. Why should not a road that would suit ricshas and bicycles at least be considered a fit object on which to expend money by those who can erect an almost palatial chamber of commerce.

The lime-kilns at Shihkweiyao still do a big trade and so does the Hupeh Cement Works (turning out 800 bags a day) under Danish management. We believe there is still a great future before this Yangtze port. May honesty and commonsense prevail and that result is assured.—*C. C. Post.*

Tokyo-Kobe Electric Railway

Yen 67,000,000 to be Expended

THE railway department has completed a draft plan for the electrification of the entire Tokaido railway, between Tokyo and Kobe, the work to be commenced from the fiscal year of 1923-4 and finished in seven years, i.e., 1920-30. The draft, as completed by the committee in charge, is now ready for the minister of railways, Count Oki, to approve for introduction in the diet. The details of the plan are as follows :

The total estimate of the cost of electrification of the line in question will be Yen 67,000,000, which will be expended in annual instalments for seven years, commencing from next year, when it is approved. The cost of repair of railways from the next fiscal year will be over-estimated and the bond policy will be reshaped, so that Yen 20,000,000 will be added to Yen 80,000,000, which was already decided upon by the government under the preceding ministry, to be secured by bond issues.

The greater portion of the cost of electrification will be consumed in building cars, amounting to Yen 35,000,000. There will be nine locomotives built for pulling special express trains, 46 for ordinary express trans, 107 for local trains and freight trains, 48 for express and large freight trains, 81 for shifting, totaling 291.

The unit of cost for building locomotives for special express trains is estimated at Yen 250,000 and for shifting at about Yen 70,000.

As for the plan of operation, since 1929-30 period is aimed at as the period of completion, the capacity to pull freight trains is estimated at 800 tons, passenger trains at 400 tons, so that there will be from 20 to 30 per cent. increase in the capacity as compared with the present.

The number of cars in a train will be increased from nine as at present for the steam trains to twelve or thirteen in the case of electric trains.

The time required in covering the distance between Tokyo and Kobe will be shortened by one to two hours, or in some cases by four hours. The time can be further shortened in future.

The power needed will be direct current, estimated for maximum use of 1,500 volts. Trolley lines are to be built over the present railway line. The power will be secured partly from the Akabane plant of the department after September, this year. The Shinano river hydraulic power plant, which is expected to be completed in 1926, will also supply power, in Tokyo and its neighborhood. The greater portion of power will be purchased from private companies.

Transforming stations are to be built at a distance of fifteen to twenty miles each, so that, for the entire length of 370 miles between Tokyo and Kobe, there will be about twenty-five such stations.

The work will be commenced from both Tokyo and Kobe, the middle sections being deferred until later years.

Whether the railway department will operate electric street car lines in the neighborhood of Kobe, Osaka, Kyoto and Nagoya has not yet been decided, in view of the existing private street car lines. It is, however, anticipated that such enterprise will be entered into by the railway department.

LIUSHUTUN WIRELESS STATION.—The new Liushutun wireless station, at Dairen, has cost Y.300,000 in round numbers. For its site, more than 15,000 *tsubo* of the old Li Hung-chang fort has been appropriated.

Three steel towers each 800-ft. tall, of triangular shape, have been erected. The antennae consist of over twenty lines. The equipments of the receiving and despatching power rooms and others is said to rank with the Funabashi station in which next to the Iwaki station, is the highest powered in the Orient. Hokkaido, Formosa, San Francisco, etc., are within communicable range. It is said that a message from a station in Germany has become sensitized on the new Liushutun station. Hitherto, foreign wireless have had to be transmitted by telegraph from the Iwaki or the Funabashi station after reaching there by wireless.

New Concrete Wharves at Singapore

Socony and A.P.C. Equip Malayan Island Stations with Re-inforced Concrete Piers

TO check the ravages of the pile worm on wooden piers, and to meet the increasing demand for petroleum by oil-burning steamers, both the Standard Oil Co. of N. Y. and the Asiatic Petroleum Co., have built re-inforced concrete wharves on their island stations near Singapore.

The American company's pier was completed last year at a cost of $175,000 Straits currency, and is situated on the British island of Pulau Sebarok, a leasehold about eight miles from Singapore which the Socony has held for some time. The wharf consists of an approach 10 feet wide, which extends into the sea for 900 feet, culminating in a T-head. On both sides of the T-head, at intervals of 150 and 250 feet, are four buffer dolphins, also of concrete, which are connected with the approach. Concrete mooring dolphins, ten feet square, are sunk behind and to the sides of the buffers.

The piles for this wharf, 200 of them, were cast on the beach of Pulau Sebarok. The sand and gravel of the island were used in mixing the concrete. Two sizes were cast, twelve and fourteen inches square. The longest piles were 60 feet in length. All driving was done by steam.

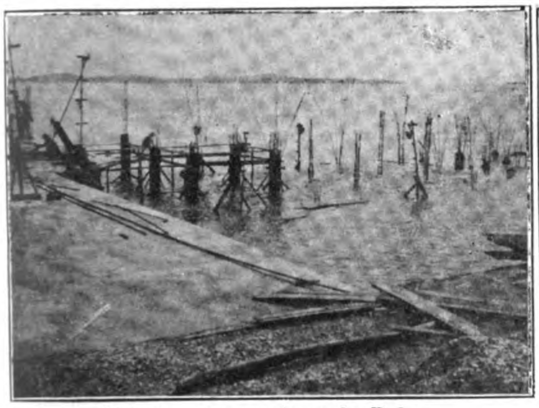
The end of the pier stands in 35 feet of water at low tide, and can accommodate any ocean-going vessel. The two sets of buffer dolphins makes it possible for two 500-foot ships to tie up at the same time. Both tankers and cargo-boats have been taking oil at Pulau Sebarok since the completion of the new pier. All the oil-burning vessels of the United States Shipping Board fuel here now.

The Asiatic Petroleum Co. has been equipping two islands with re-inforced concrete wharves—Pulau Bukom, eight miles from Singapore in British waters, and Pulau Samboe, twelve miles away in Dutch territory.

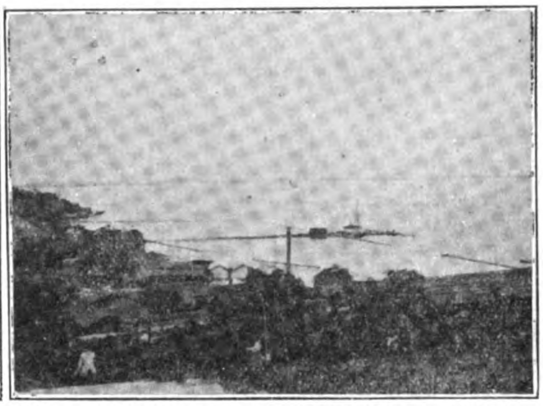
Wharf No. 2, on Pulau Bukom, was just finished in April of this year at a cost of $280,000. The construction is similar to the Socony wharf, and the whole project fits in with the new benzine installation. Wharf No. 2 extends out beyond a field of coral reefs which is being filled in and reclaimed. Here will be the plant which will handle and pack the benzine refined at the A.P.C. fields in Sarawak and other parts of the Malay archipelago.

Another deep-sea wharf, No. 3, on Pulau Samboe, is costing $150,000. While not as large as No. 2, it juts out into 35 feet of water, and can take care of ocean-going vessels. A $30,000 tongkang jetty, to take care of native tongkangs, or lighters, has also been included in the re-inforced concrete work on Pulau Samboe. It is built in eight feet of water, and will be used in connection with the benzine installation.

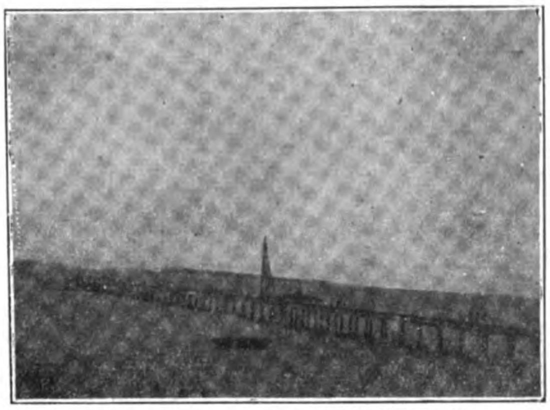
The construction of both Socony and A.P.C. has been carried on by the United Engineers, Ltd., of Singapore, under the supervision of A. F. Dale, head of the constructional civil engineering department.



Construction work on the Pulau Bukom wharf

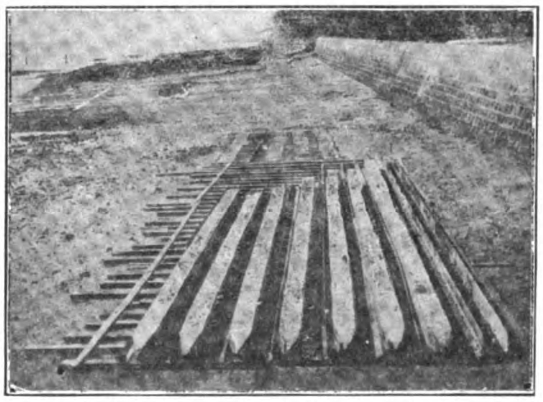


The A. P. C.'s new concrete wharf No. 2, at Pulau Bukom. The water from the end of the pier to the shore, which seems to be marked off in a rectangle, is all underlaid with coral, and is being reclaimed to furnish space for the new benzine installation

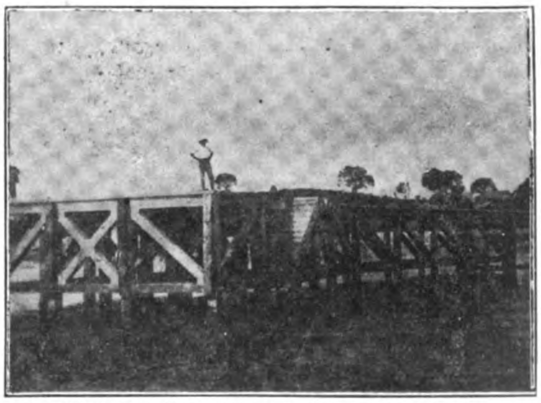


The concrete pier recently finished for the Socony at Pulau Sebarok

Indian labor casting concrete piles for the Pulau Sebarok pier



Sixty-foot piles for the Socony wharf



Thirty-five feet of water at low tide, permits ocean-going vessels to come alongside the new Socony pier at Pulau Sebarok

The Chartered Bank's New Building

FRONTING the Bund the new Chartered Bank building will be five storeys in height, of heavy, dignified, classic design, Neo-Grec in style with little ornament.

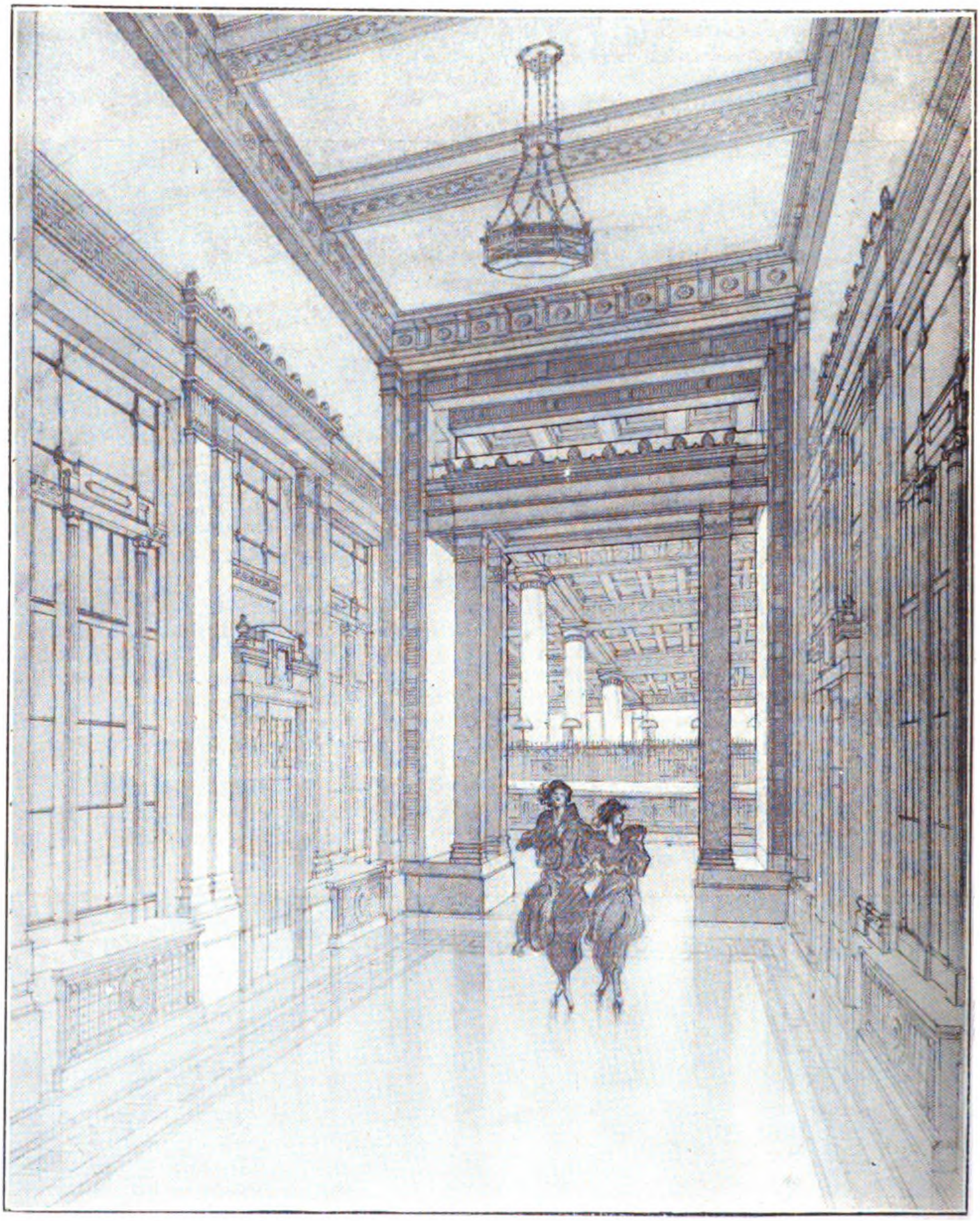
With the exception of the space occupied by the entrance hall and staircase giving access to the upper floors, the whole of the ground floor and subground floor will be occupied by the bank. The entrance to the bank will be a very fine pair of bronze gates made in England. The entrance vestibule is square in plan with four Brecchia marble columns, one in each angle, the walls are to be lined with Pavonazzo marble of a rich cream color with a black marble plinth. The floor will be in Roman marble mosaic and the ceiling of fibrous plaster.

The building is of steel framed construction with reinforced concrete floor and roof slabs, and fire-resisting throughout. The walls are filling only, the steel beams carrying the whole of the weight independently of the walls. The steel will be protected against corrosion and fire.

The foundation consists of two reinforced rafts, one for the main block and a separate one for the back block, where are situated the treasuries. Between the two rafts there is a straight joint. The site was piled with Oregon pine piles 25-ft. long.

The architects for the building are Messrs. Palmer & Turner, the design having been in the hands of Mr. G. L. Wilson, F.A.S.I., who has already done so much successful work in China.

The contractors are the well-known London firm, Messrs. Trollope & Colls, who, it is of interest to note, erected the head office of the bank in the metropolis some years ago.



Entrance Hall to the New Building *North-China Daily News*

THE NEW CHARTERED BANK BUILDING

North-China Dai

Glen Line's New Building

IN style, the building is free Renaissance, with clear-cut lines and imposing design. It has a frontage of 300-ft. on The Bund and Peking Road and is 90-ft. in height

The ground floor will be occupied by the offices of the Glen Line Eastern Agencies, with the entrance in the centre of the Bund frontage, consisting of an imposing portico with two granite columns, one on either side. Inside the main entrance is a semi-circular teakwood counter, the floor being of black and white marble terrazzo. The main office is lofty and dignified; the woodwork is all either of oak or teak, producing an effect of richness without ostentation and dignity without sombreness. The office occupied by the manager is a very fine room indeed, with panelled dado in teak, large fireplace and mantleshelf, of either side of which are large glazed cupboards. The doors to this room, and in fact to all the principal offices in the building, are large single panels with bolection mouldings.

Offices are also provided for the compradore and his staff, while there is a large strong room for books, and documents. The sanitary fittings throughout are of the most modern design.

A particularly delightful feature of the building is that the lighting is indirect, the electric lamps being concealed in large bronze bowls suspended from the ceiling, the light being obtained by reflection.

The remainder of the offices on the ground floor and all the upper floors are being let. The ground floor offices facing on to Peking Road have an imposing entrance. This office is one of the largest single offices in Shanghai, being 8,000 square feet in area.

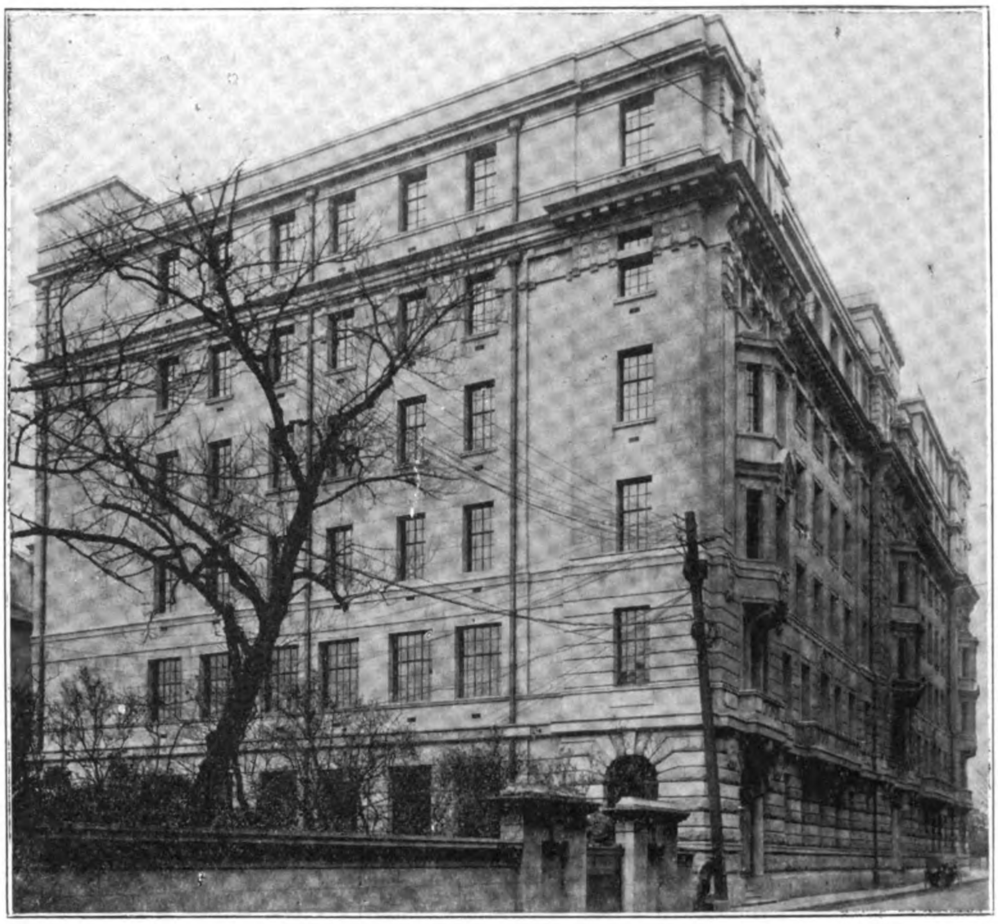
The main staircase is situated in the centre of the north wall between two lifts, and is approached through a wide archway. Two electric lifts give access to the upper floors, which are designed as large open spaces to be divided up so as to suit incoming tenants. Sanitary arrangements have been made so that each office has at least one lavatory. Strong rooms and coolies' rooms are provided on every floor, while there are separate stairways for coolies, which have been designed so that in an emergency they may be used as fire escapes. On the top floor there is a residential flat which is occupied by the general manager.

New Building of the Glen Line Eastern Agencies, Ltd., Bund and Peking Road, Shanghai
(Palmer and Turner, Architects)

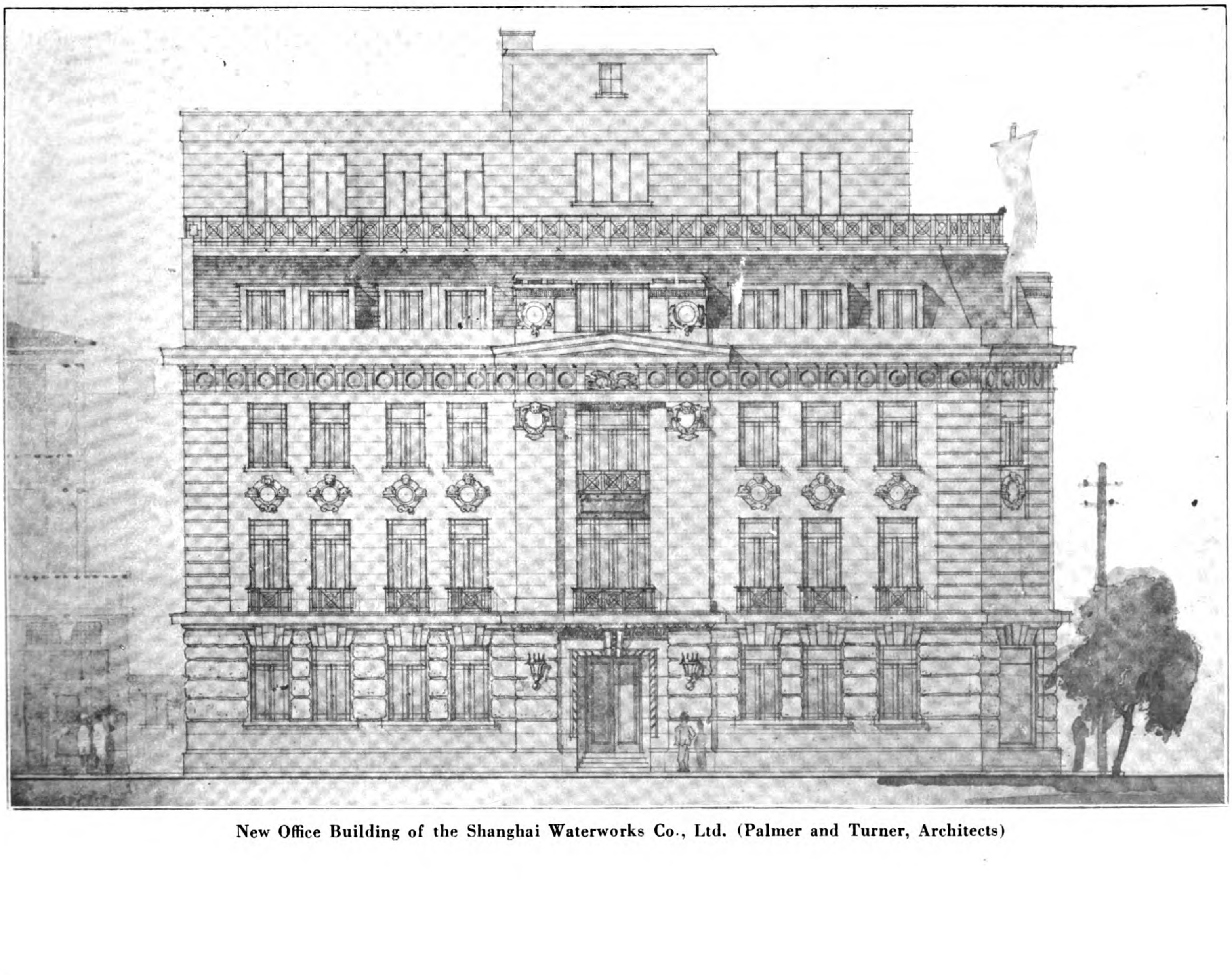
The building is fireproof throughout, built on the principle known as skeleton frame reinforced concrete, the columns, beams, roof and slabs all being of this material. The foundations consist of a raft of the same material, by means of which the weight of the building is spread evenly over the whole area.

The whole is warmed throughout by low-pressure hot water, while water is stored in tanks for domestic and fire purposes at convenient places. Special connections have been made to facilitate the work of the fire brigade in case of fire. The roof is flat with a deep ventilating space below connected to vertical ducts wherein are placed extra fans to circulate the air, thus keeping the upper floors cool in summer.

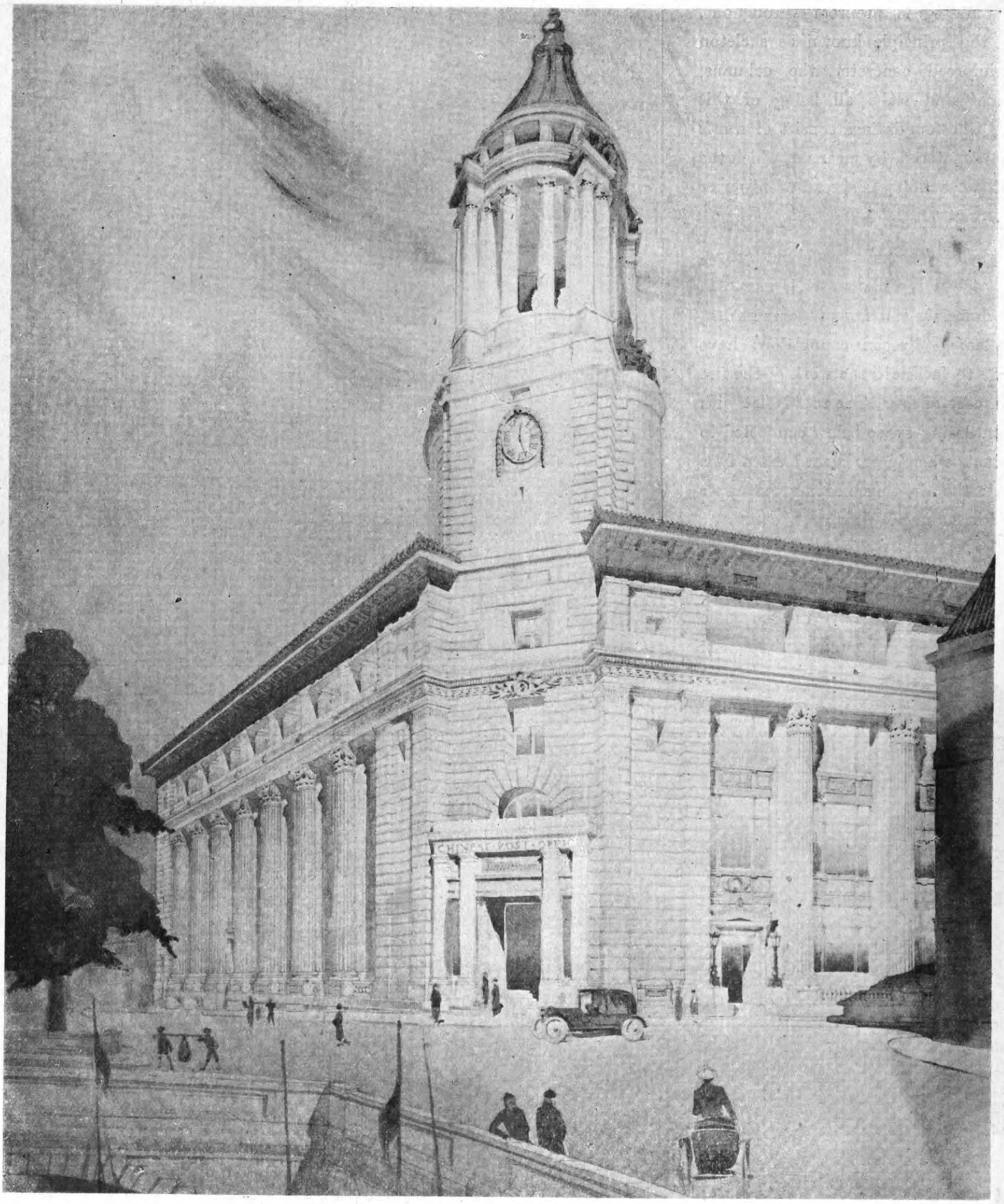
The architects are Messrs. Palmer and Turner, while the contractors are Messrs. Trollope and Colls, who have erected some very fine buildings in London and the Far East.



Glen Line's New Building, Peking Road Facade



New Office Building of the Shanghai Waterworks Co., Ltd. (Palmer and Turner, Architects)



NEW CHINESE HEAD POST OFFICE FOR SHANGHAI

THIS building occupies a commanding site at the corner of North Soochow and North Szechuen Roads, immediately across the new bridge, at present in course of construction.

It is roughly U shaped in plan, 5 storeys in height, fronting upon North Soochow, North Szechuen and Tiendong Roads, with the various postal departments conveniently arranged to meet the requirements of the public and allow of rapid and efficient handling of in-coming and out-going mails. Flats and quarters for members of the staff occupy the top floor.

The principal facades to the North Soochow and North Szechuen Roads are designed in the form of a single massive classic colonnade rising direct from pavement to a height of more than 50-ft.

It will be constructed of granite in the lower portions and artificial granite above.

At the corner of these two frontages is placed a clock tower some 150-ft. in height, which forms a dominating feature of the design.

The architects are Messrs. Stewardson & Spence, who obtained the award in the competition recently held.

New Custom House Building for Hankow

THIS building will stand on the site of the old custom house at the end of the Bund of the British concession.

The new building is four storeys high, surmounted by a tower rising to a height of nearly 150-ft. above the pavement. Liberal accommodation for the various departments of the customs service is provided on the ground, first and second floors, while the third floor is given up to two spacious residential flats.

The building forms an almost square plan with sides of approximately 120-ft., faced throughout with Hunan granite.

The principal feature of the elevations to the river, Ho Kai and the face looking down the Bund is a massive Corinthian classic order running through three storeys, with solid granite columns four feet in diameter. The order rests on a heavily rusticated basement storey and supports a full classic entablature and strongly emphasized solid parapet wall above the same. The main entrance is of liberal dimension and faces directly down the Bund. It is approached by a very broad external granite staircase, rising through the whole height of the ground floor to the first or principal floor of the building.

The entrance halls and principal corridors will be suitably treated internally with marble and mosaics.

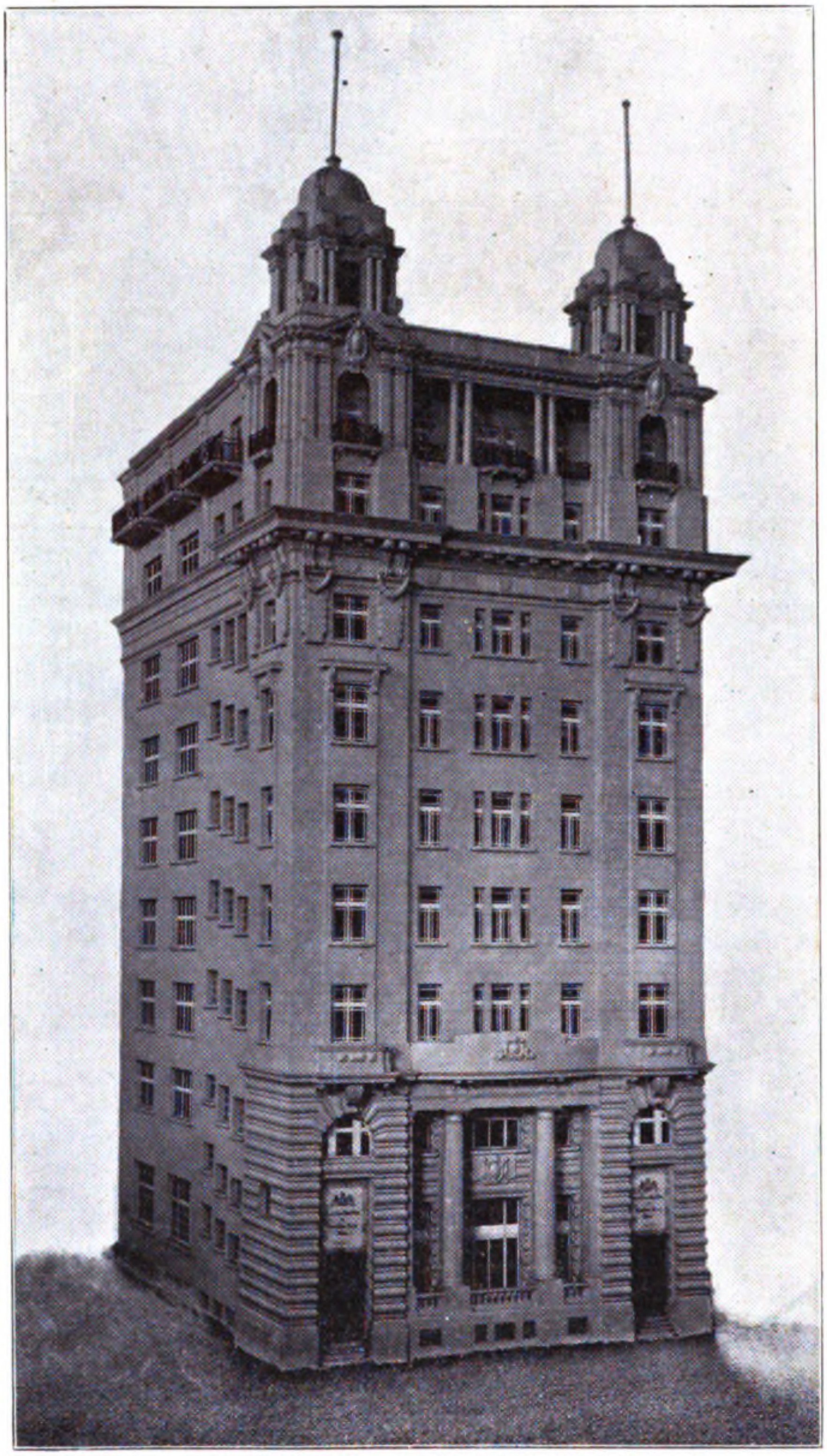
The architects are Stewardson and Spence, who obtained the award in the recent competition for the work, while the general contractors are Why Ching-kee. The heating and sanitation is in the hands of Messrs. Gordon & Co., Ltd., and the steel windows will be supplied by Messrs. Henry Hope.

New Home of the "North-China Daily News"

THE new home of the *North-China Daily News* will be the tallest office building in Shanghai. Due to the width of the Bund this is possible, for elsewhere in the city the building by-laws prevent the erection of an edifice higher than one and a half times the width of the road. Consequently the eight storeys that are planned with the twin cupolas, one at each end of the facade, will attain a height of 140-ft. as against the Palace Hotel which is just a little under 100-ft. This applies to the front portion of the building, the greater half; for the back part of the building only seven stories are contemplated. The whole will stand on an area with a 61-ft. frontage and a depth of 170 feet, these being the dimensions of the building itself and not the plot on which it will stand.

Built of reinforced concrete throughout, with granite facings, the front of the new offices will present a dignified appearance to the Bund with a well proportioned facade in which handsome fluted columns will form the main motif, the flat roof being adorned with two towers surmounted by gilded cupolas, and between them will be erected the flagstaff.

On the ground floor accommodation will be provided for banking offices, with entrance at the northern end of the frontage. These offices will occupy the whole of the ground floor, a portion of the next floor being allotted for general offices, and the printing plant of the *North-China Daily News*. It is proposed to use the third, fourth and fifth floors for offices, and the plans as they stand give the whole floor space as one large area, which it is designed to sub-divide by means of patent partitions according to the requirements of tenants. On the fifth floor will be located the editorial offices of the *North-China Daily News* and above them residential flats. Throughout the building the ceilings, which have been designed on the latest lines, will give a flat even surface by means of patent filling between the beams supporting the reinforced concrete floorings.



Photograph of Model of New Building of the North-China Daily News & Herald, Ltd.

Adequate sanitary installations are to be provided on every floor, central heating will be installed, and three passenger lifts will run, in addition to the necessary number of staircases. On the outside of the building there will be emergency staircases, for use in case of fire, which should be unlikely in view of the nature of the fireproof construction, giving all the necessary facilities for escape from the building in case of an outbreak.

The rear half of the building, seven storeys in height, will be separated from the front building by a hollow double wall designed to deaden the sound of the printing machinery at night. Here will be housed the presses, lino-types and all other essential equipment of an important up-to-date printing establishment, while sufficient space will be allotted to storing of paper and other supplies.

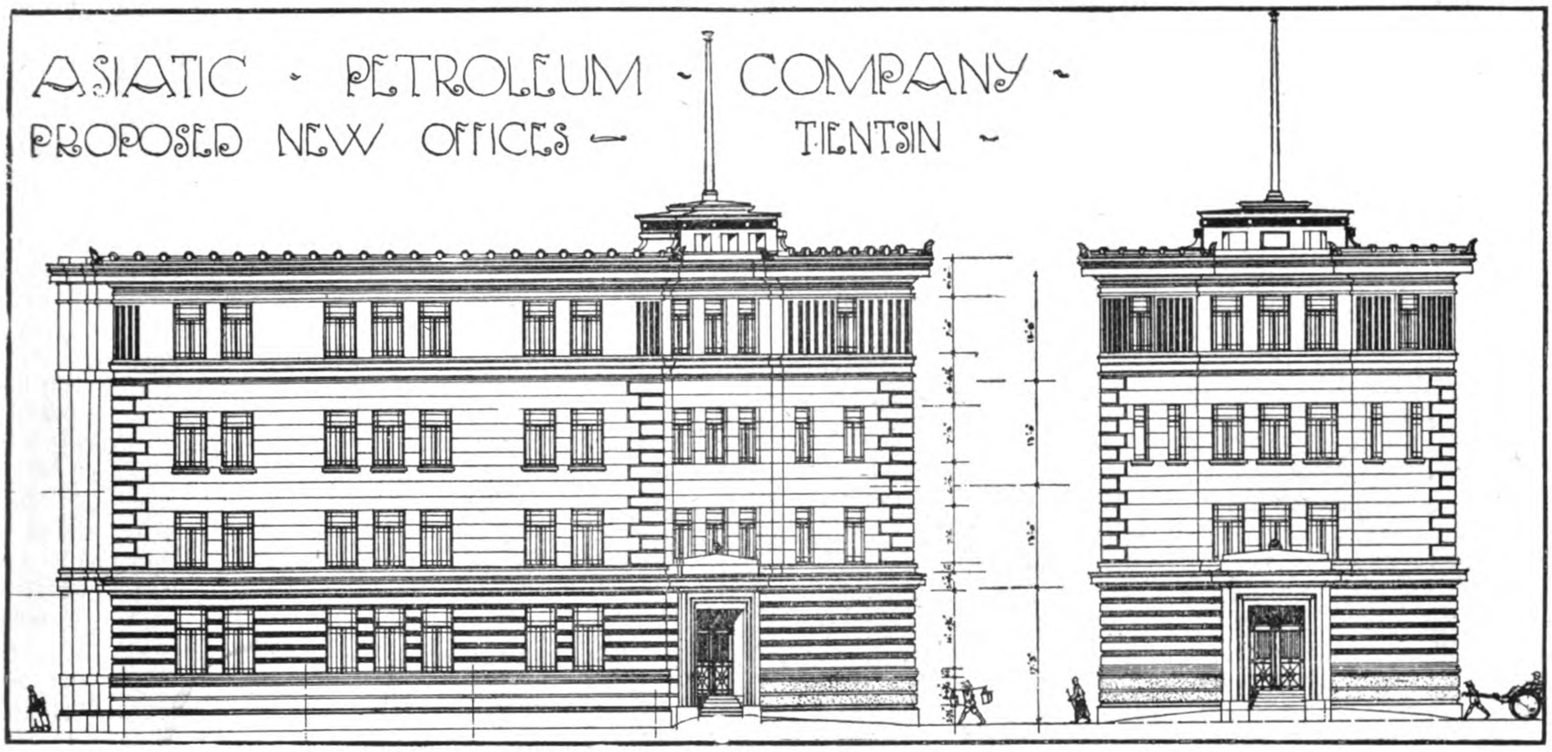
Netherlands East Indies Railways Electrification

After close study of conditions extending over several years, the Dutch East India authorities have decided to electrify the whole railway system. Direct current at 1,500 volts is to be used, but later the Batavia-Sourabaya section may be raised to 3,000 volts direct on a single-phase system if conditions warrant.

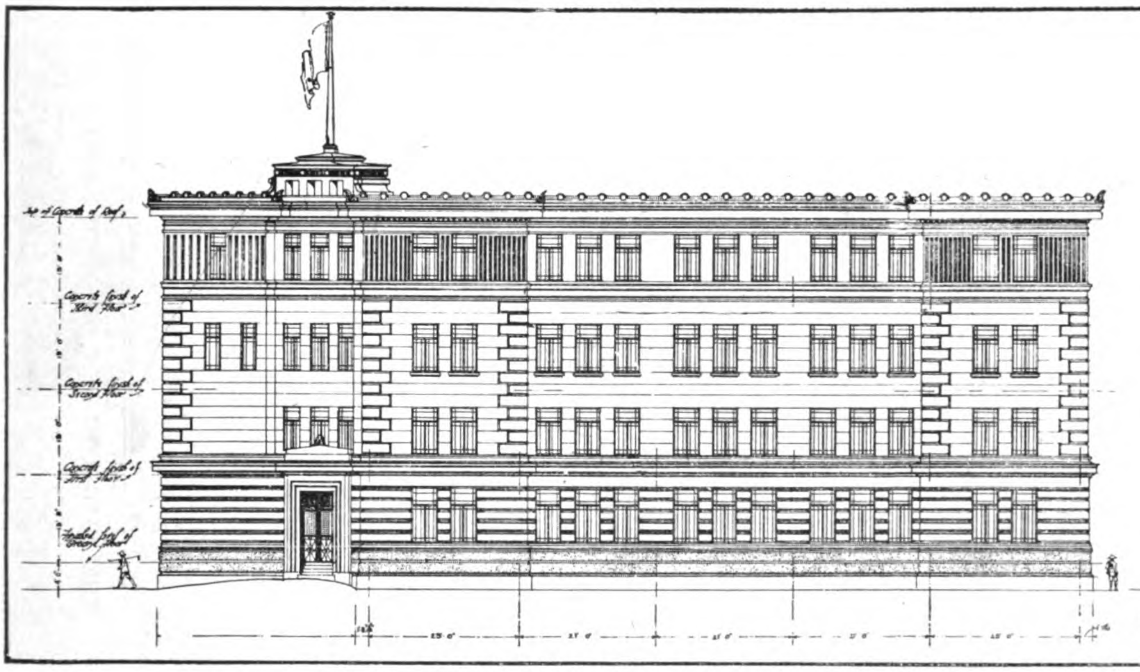
Two power stations, giving about 40,000 horse-power, are being erected, one to the south-west of Sukabumi on the Tjitjatih, about 63 miles from Batavia, and the other on the Tji Anten, about 44 miles from Batavia. It is estimated that of this 40,000 horse-power, 30,000 will be required for the line and that 10,000 will be available for light and power in other directions.

It is expected that the first part of the line, between Meester Cornelis and Tandjong Priok, will be in operation early next year.

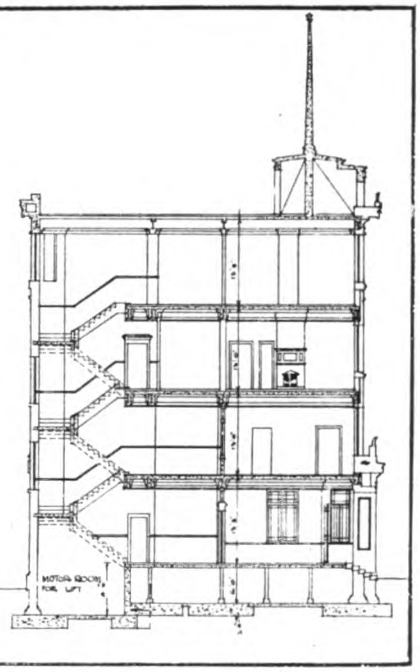
Tandjong Priok is sharing to a large extent in the awakening of activity observable in the Far East, and the electrification of its rail service should assist its development and add to its importance. A project is under consideration to erect a tin-smelting works at this part, and British experts have been consulted to assist in the decision as to whether open or closed furnaces should be used. Once this question is settled it is expected that the work of erection will proceed.



Elevation to Meadows Road., S.E.



Elevation to Taku Road, N.E.



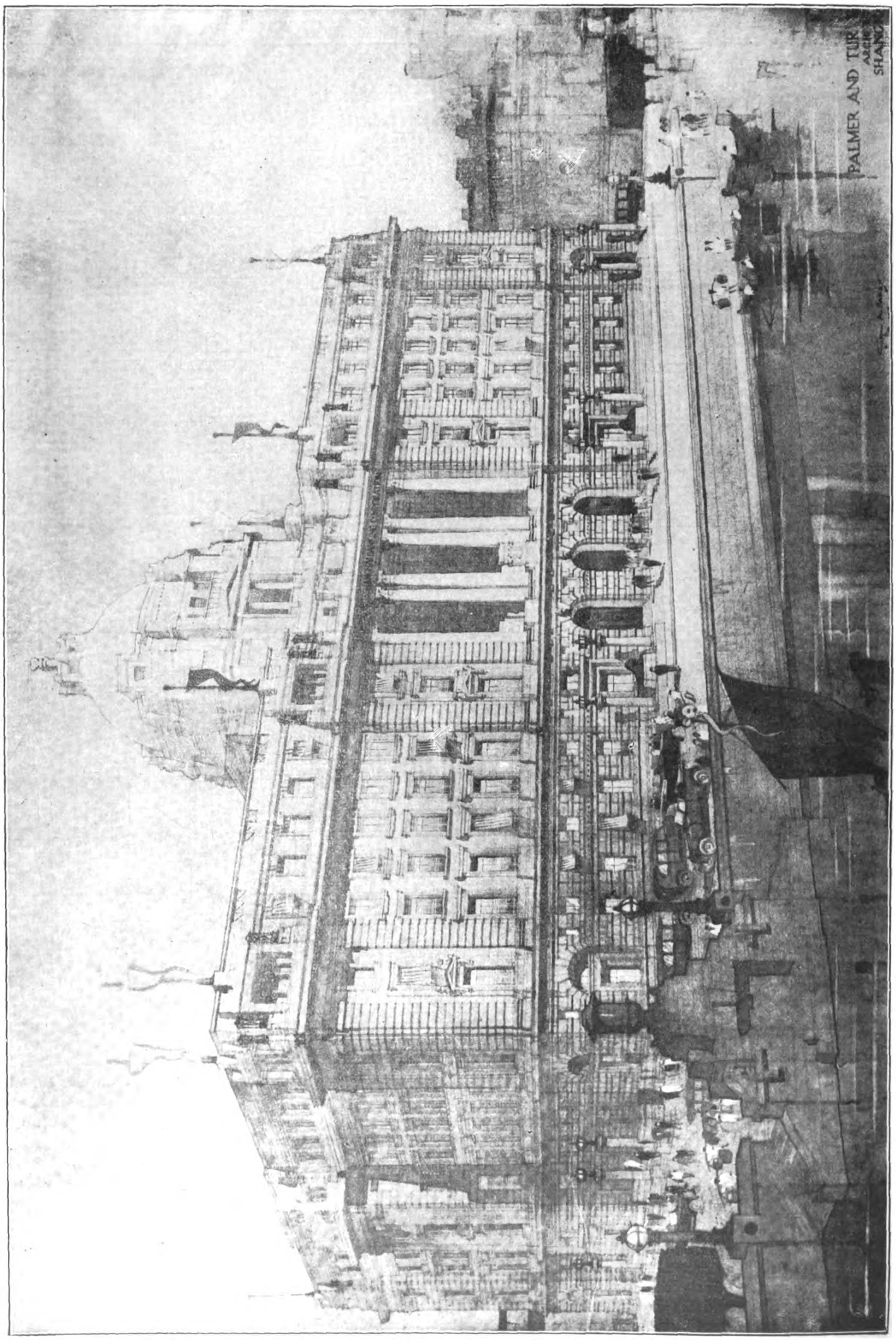
Elevation of Circular Portion at Corner Section A.B.

Asiatic Petroleum Company's Offices at Tientsin

THE plans show a four-storey office building with living quarters above, to be constructed for The Asiatic Petroleum Co., Ltd.

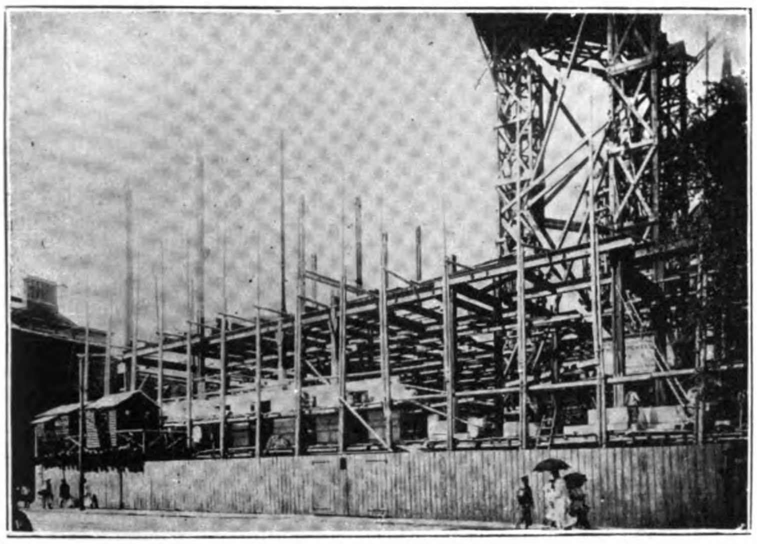
The building will be a steel-framed structure with granite facing. It is finished throughout in first-class modern style ; central heating and electric lift are provided. Special precautions are being taken against the extremely cold winds of winter and the dust-storms spreading from the Gobi Desert, double windows being provided where necessary. The building is fire-resisting, and is to be fitted throughout in a serviceable and up-to-date manner, due regard being had to the making for cleanliness and reduction in cost of upkeep.

The architects are Palmer & Turner, of Hongkong, Shanghai and Hankow, whose London address is c/o Mr. F. Oswald Reynolds, M. Inst. C.E., of 109 Victoria-street, S.W.1.



THE HONGKONG AND SHANGHAI BANKING CORPORATION'S NEW BUILDING AT SHANGHAI
Drawn by Cyril A. Farey: Palmer and Turner, Architects

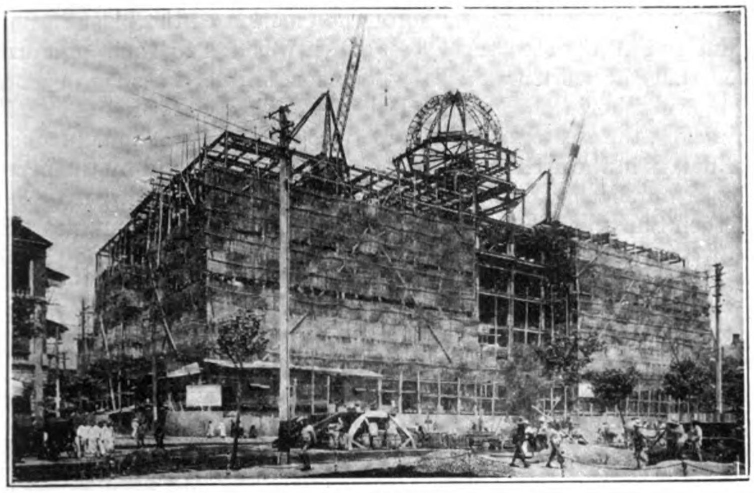
PROGRESS VIEWS OF BANK BUILDINGS IN SHANGHAI



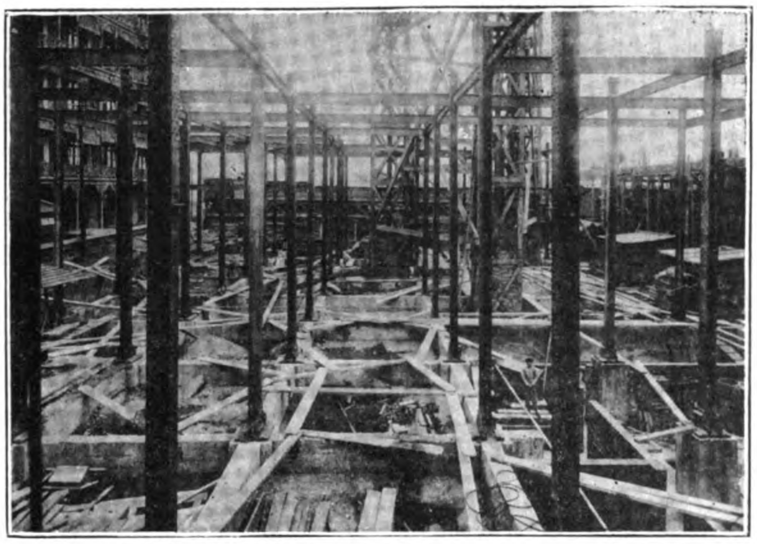
The Hongkong and Shanghai Banking Corporation Building, Shanghai, August 2, 1921

THE SITE OF THE NEW CHARTERED BANK BUILDING, OCTOBER 16, 1921

View of Excavation for Front Block, Looking East. Palace Hotel on left and some of the old piles in background. Concrete Mixer on left



June 19, 1922



View on February 28, 1922. Looking East towards Bund Front

OFFICE HELPS IN CHINA

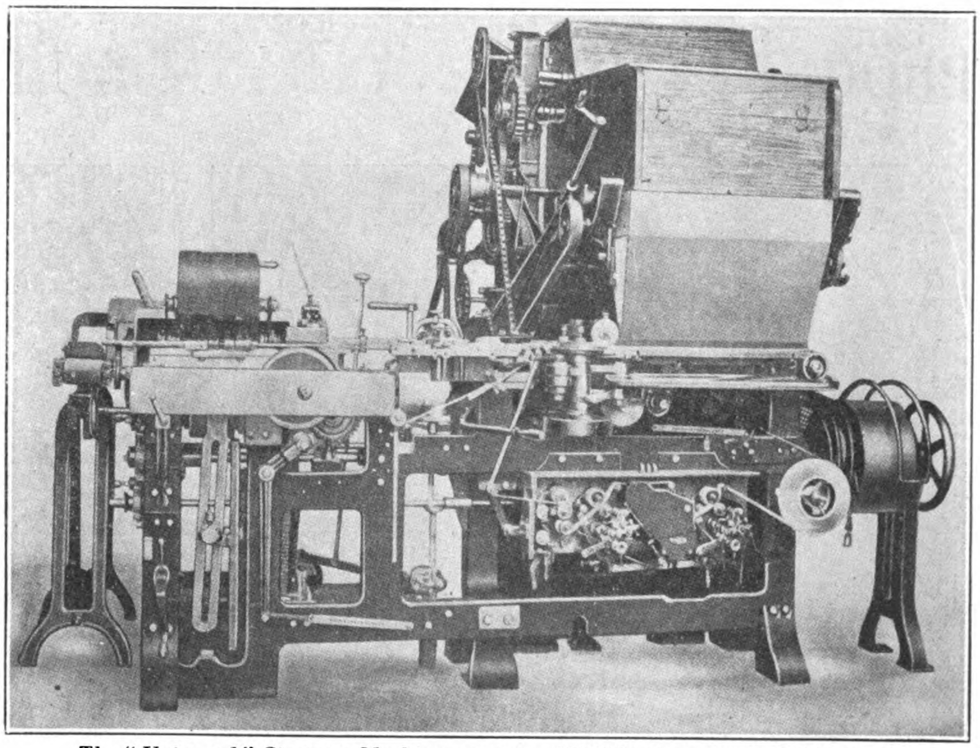
In a recent contest at Shanghai an American adding machine proved its superiority over the abacus, the age-old calculator of the Far East, to such an extent, according to Trade Commissioner Lynn W. Meekins, that the latter lost a good deal of the veneration it heretofore received. Up to the time of the contest, which was between an American salesman for the adding machine and a Chinese adept in the use of the abacus, the latter device had been regarded as an insurmountable obstacle to the general sale of the former in China. The contest was witnessed by a large number of spectators, according to Mr. Meekins, all of whom were surprised by the marked superiority of the American device.

"With more than 8,000 foreign firms, including Japanese, hundreds of native progressive firms in the treaty ports, and numerous government offices," Mr. Meekins says in a report to the bureau of foreign and domestic commerce, "China is buying a steadily increasing quantity of American office specialties annually. For several years the value of exports of American typewriters to China has averaged about $250,000. Adding and calculating machines, duplicators and devices—such as check protectors, time and date stamps and pencil sharpeners—are being sold in the large commercial centres. Metal furniture is in demand on account of climatic conditions along the China coast, and filing and loose-leaf equipment is finding a fair market.

"American firms in Shanghai are actively pushing the sale of office specialties with very satisfactory results. By sending experienced representatives to demonstrate the merits of modern equipment to business men in the outports, they are in a position to take orders and make prompt delivery from stocks carried in Shanghai."

New Cigarette Machine

Expected to Revolutionize Cigarette Industry



The "Universal" Cigarette Machine, capacity, 250,000 crimped or 275,000 pasted cigarettes per day of ten working hours, manufactured by the United Cigarette Company

ADVICES have been received from our American correspondents advising that a machine for making cigarettes of entirely new design and construction has been placed on the market.

This machine, which is called the "Triumph—Model UG" is capable of making 800 plain or tipped cigarettes per minute, or approximately one-half million cigarettes per day. Devices can be furnished for making either round or oval cigarettes to be pasted or crimped, either plain or with tips of gold, cork or paraffin.

Aside from this phenomenal production which is practically double that of any machine formerly known, the machine is a marvel of simplicity and can be operated by inexperienced girls. Simplicity and durability have been combined, and cigarette producers at least can secure a machine with a minimum of parts subject to wear and which have to be replaced.

Will the casual smoker preoccupied with his daily cares, who enjoys the soothing balm of the cigarette, stop to consider that his smokes are made at the rate of one-half million per day on a single machine operated by two girls? Perhaps he will also be interested to learn that Virginia, the home of tobacco, has also fostered and given to the world the mechanical means for making cigarettes.

Nearly a half century ago the original cigarette machine named "Bonsack" was introduced by the United Cigarette Machine Co. of Lynchburg, Virginia, whose "Universal" and "U-K" models are also known in every corner of the world. The latest achievement of the pioneers of the machinery for the great industry is their new model "TRIUMPH" machine which the manufacturers state will revolutionize the industry.

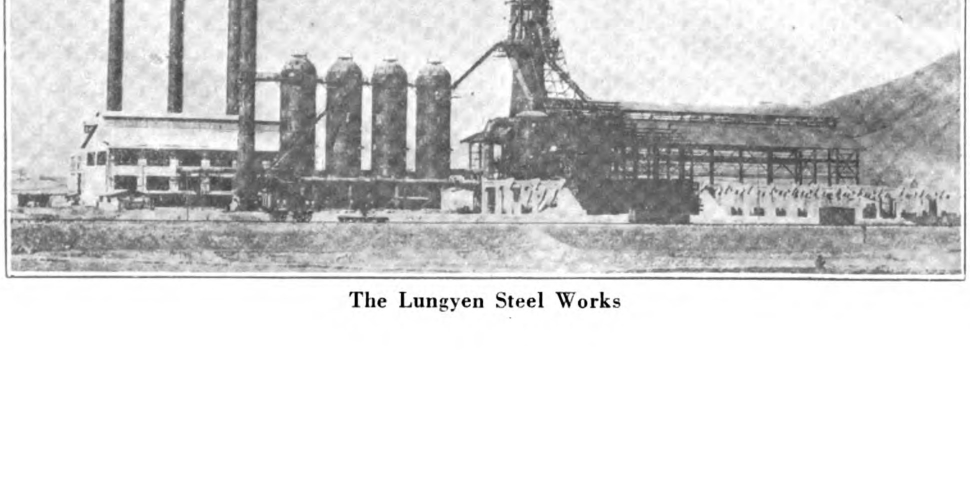
The Lungyen Steel Works

IN the March number of THE FAR EASTERN REVIEW was reprinted an article from the *Journal of the Association of Chinese and American Engineers* describing the new Lungyen steel plant in North China. The article, however, failed to mention the prominent part in the erection of the plant assigned to the French Engineering Works of Shanghai (Sociéte Franco-Chinoise de Constructions Metalliques et Mecaniques) more familiarly known under its old name of the Nicolas Tsu Engineering and Shipbuilding Works. This company had full charge of the erection of the blast furnace plant and all the structural steel and it was due to their organization that the work was carried out successfully in such a comparatively short time. Starting August 2nd last year, progress was at first slow, the erectors being hampered by the frequent and unlooked-for delays in the arrival of material from America, and by the necessity of purchasing or making many special tools and other materials at their Shanghai plant and shipping them north. Communications between Shanghai were many times interrupted, delaying the arrival of tools, skilled workmen, etc.

This achievement is a time record upon which the French works may justly pride themselves.

The work comprised the following items :—

One blast furnace of 250 tons; one skip bridge; one coke bin; four hot blast stoves and chimney; platforms around stoves and chimney; bleeders, downcomers, dust catchers, gas mains to the stoves and the boilers, hot and cold blast mains to the blowers, etc.; three boiler chimneys; one boiler house; one power house; one cast house; pump houses; water tower; other auxiliary structurers. The total weight of all structural material was about 1,800 tons.



The Lungyen Steel Works

Japan Gets Cable Contract

A contract is reported in Japanese circles to have been concluded between the Chinese government and the Furukawa Mining Co. It calis for the laying down of a cable between Shanghai and Chefoo, a matter which has been hanging fire for some considerable time, partly due to the anti-Japanese movement let loose by the students with an energy worthy of a better cause, and to a large extent on account of the chronic lack of funds on the part of the Chinese government.

The Furukawa Mining Co. is not only one of the largest Japanese industrial corporations, but one of the most important in the entire business world.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, JULY, 1922.

Machinery Trade in China

Why British and American Manufacturers of High Grade Machinery and Machine Tools Suffer in the Competition for Chinese Trade.

THE following remarks on the machine-tool trade of China from the Hongkong correspondent of *The Times Trade Supplement* contains certain facts that all foreign manufacturers of machinery will be wise to take notice of. We do not altogether agree with the writer's assertion that the Chinese are always looking for the cheapest bargains, for if this were true, there would be few sales of high-grade machine tools in this country. His remarks, however, do hold true to a large extent as far they relate to the smaller Chinese machine-shop owners. The essential point in what he says, is embraced in the statement that "*It is unfortunately true that the Chinese feel that they are taking a risk in buying almost any machinery, because very few are able to judge the merits of design or construction.*" We invite attention to this, as herein lies the answer as to whether engineering advertising in Chinese papers is of any value. In the first place, there are no equivalents in the Chinese language for foreign technical terms, and there is no way to bring out forcibly the merits of any particular machine. The best that can be done is to appeal to the foreign-educated Chinese engineer, who is consulted at some stage of the negotiations for any large order, and his opinions acted upon.

About all that can be hoped for is to educate the Chinese to the reputation of a name or chop and what these names stand for in their particular line. In other words, the same process of education must be carried out in China, Japan and other Oriental countries, that has proved successful in other parts of the world. The machinery manufacturer must follow the same publicity methods as he would at home, advertising his own specialities under his own name. The tendency to group a large number of manufacturers under one representative or selling agency in China, has its merits in cutting down the selling overhead, but in this zeal to decrease expenses, the question of publicity is invariably ignored. As a consequence, the Asiatic purchaser of machinery, who has not been educated to the merits of mechanical specialities made by well-known foreign firms, has no option in the matter. He simply insists on having the cheapest machine tool or other machinery that will do the work. In a field where the manufacturers of all nations are evenly represented, and where quality in many cases is sacrificed to price and terms of payment we cannot blame the uneducated Chinese from placing his order with whoever quotes the lowest and gives long credits. The fault does not altogether lie with the Asiatic. It must be shared by those manufacturers, who for years have turned a deaf ear to all suggestions about proper publicity in this field, insisting that his agent stand the full burden of educating the Asiatic in engineering matters. The Chinese, like the Japanese, *can* be educated to purchase high-class machinery and machine tools, but to do this requires a radical departure from present publicity methods. The manufacturer must make up his mind that if he is to succeed in this field, he must select an engineering medium for his advertising and stick to it, in the same manner that he does at home. The cumulative effects of such advertising are the same. Most of the successful machinery manufacturers in this part of the world are those who years ago recognized this fundamental principle in Asiatic business and are now reaping their rewards in orders.

In some cases that we could mention, these methods have obtained for the manufacturer a practical monopoly of the business in their respective lines. Proper publicity will strengthen the hands of local agents and make for increased orders, the same in China as in the United States, England or other markets. When the manufacturers of high-grade machinery (British, Americans, or of any other country) realize and act on this fundamental truth, the day will arrive when the Chinese buyer will be as discriminating as those of any other country.

The root trouble with most large foreign manufacturers whose names are well known to engineers in other countries, is that they assume, as a matter of course, that the prestige of their name has also spread to China, and the mere fact of hanging out a brass sign along with a dozen or more in front of some agent's office, is going to duly impress the field with the fact that he is in China to do business. As a matter of fact, the name of the greatest manufacturer of any specialty (especially in the engineering lines) means nothing to the average Chinese. They refuse to be impressed. The manufacturer who makes good in China is the one who has the initiative to take upon his own shoulders the expense of advertising his engineering specialities in an engineering publication.

Following this up by a proper campaign that will make his particular name and specialties known to the field. It is the only road to success in Asia.

Such advertising may not reach the smaller Chinese, Japanese or other Asiatic machine shops or mills, but it will reach the more important, and pave the way for the education of smaller concerns, who, as they expand, will demand the higher grade tools and machines that have proven successful in the larger plants. The following article was intended primarily for British consumption, but the same facts hold good with high-grade machine tools from other countries. It is not altogether German competition and low prices which attract the Chinese buyer. The Japanese machinery manufacturer is also very active and many of their specialities have found a secure place in the Chinese machinery trade. The number of machine tool and machinery manufacturers in Japan is constantly increasing, and their products are considered good enough for the vast majority of Japanese machine shops. They will also find their place in the smaller shops of China and other parts of Asia.

The time has arrived when other machinery manufacturers must face these facts. If they lose the market there is no use of blaming the Chinese for their lack of appreciation for better grade tools and machinery. Educate them in the same way other peoples have been educated and they will demand the best.

G. B. R.

The Hongkong correspondent of *The Times Trade Supplement* writes:

"A few days ago a representative of a Danish machine tool company arrived in South China. Although the traveler did not bring his prices directly to the notice of the writer, it has been possible to obtain a copy of those quoted to local firms. They seemed at a first glance to be remarkably low. This led to enquiries concerning the local selling prices of British machine tools, and the results are of considerable interest.

"It should be understood that the present discussion is confined solely to the question of price, ignoring considerations of quality. In the eyes of the Chinese buyer, however, the price means almost everything. A local agent showed a Chinese from Canton a price list in which a certain machine tool was quoted at £50. The Chinese customer immediately said: 'I buy that one—velly cheap. Suppose no good, lose only a few hundred dollars.' It is unfortunately true that the Chinese feel that they are taking a risk in buying almost any machinery, because very few are able to judge the merits of design or construction. Many Chinese buyers of engineering products are unable to distinguish between a very good article and one that is lighter and generally not so reliable.

"Consider first of all the local selling prices of screw-cutting 6-in. lathes. The price of a British lathe is £267, while the foreign-made machine can be supplied at less than half the price—namely £130. It is noticeable that on this list of foreign lathes there has been a reduction since last year. Then the price was £130. No doubt the British lathes have also been reduced in price, but it has not been possible to obtain a list. British manufacturers do not publish their prices as freely as the Chinese would like. The exception is the motor industry, and other engineering manufacturers might follow that lead.

"Take now 8-in. lathes. A local quotation for a British lathe is about £400; the foreign-made machine can be sold in South China to £230. Again, the British 10-in. lathe, which is quoted locally at £537, seems to the Chinese buyer ridiculously high in price as compared with its competitor, which is quoted at £325.

"It would be possible to give many similar comparisons, but the general result would be much the same. It may, however, be noted that this price list of the non-British machine tool company is in English, and that the lathes have such essentially British names as "Lion" and "London" and 'Calcutta.' One lathe is called 'Britannia'!

"For American machine tools it has been difficult to obtain local prices, but the Chinese say that they are lower than those quoted for British machine tools.

"It will surprise some readers of this journal to learn that a certain shaping and planing machine giving a 10-in. length of stroke (hand power) is quoted at £20 for local sale. A British shaping machine (stroke to 12-in.) costs £200 in China, whereas this foreign firm sells a 10-in. machine (not hand power) at £50, and a 16-in. machine at £106. Last year the latter machine was priced at £126. British 16-in. to 18-in. machines are quoted locally at £250, while the foreign firm will supply a 22-in. machine at £150, the 18-in. machine being £120.

"To quote comparative prices of planing machines, a British machine 6-ft. by 30-in. costs locally £625; a machine of very similar dimensions from another part of Europe costs £370. The latter is called the 'Asia,' doubtless with the idea of conveying the impression that it was built for this market.

"A British 25-in. drilling machine costs locally £215, while its foreign-made rival, a 24-in., costs £68. That is just about typical of drilling machines.

"These figures were supplied privately by one of the local agents who much wishes to sell British machine tools. They were given in all good faith, and while it may be true that in the course of business they may vary a little, yet for comparative purposes they may be accepted.

"Unfortunately, it is not only in the machine tool industry that the British agents in China find themselves hopelessly undercut. At present local conditions make the British engineer in the Far East none too happy concerning the supply of machinery from Britain to China. Prices must come down if more trade is to be done.

"These facts are set forth not in any croaking spirit, but with the sole desire that those interested in Great Britain will realize what is happening. Many believed that after the splendid organization of the munition factories in Britain the costs of production would go down so quickly that the factories 'at home' would be kept busy with orders from overseas markets. No attempt is here made to allocate the blame for the existing high prices. They may be due either to labor, capital or to politicians.

"With these details the Chinese buyer is not concerned. He wants an inexpensive article, and although there have been times when he has gladly paid a high price to obtain British machinery, such occasions are scarce. When it is a matter of buying a lathe or drill, names of makers mean very little to Chinese purchasers, who know nothing of machinery, and therefore it is suggested that British machine tool manufacturers should give special consideration to the Far Eastern market. There should be a permanent exhibition of such tools in South China.

"All that one can hope just now is that prices of British machinery saleable in China will fall rapidly.

"It is true that large orders for British machine tools have been sent from South China to England since the war. They have been for tools for the local dockyards, the largest two of which are controlled by British subjects. Their advisers evidently persuaded the directors to pay the high prices in order to get the best article. It is said that one of the local dockyards has given orders for nearly a million dollars' worth of British equipment for its extensions and re-organization. Many other South China firms follow their most excellent example, for every patriotic Briton wants the workshops of the old country to be full of orders."

* * *

Another factor in the Chinese machinery trade which has a marked bearing on the success of German firms is pointed out by the Peking correspondent of *The Engineer* of London, who says:

"For some time there have been indications of considerable activity on the part of the Chinese who were associated in business with the Germans before the war. Germany is fast recovering her pre-war trade with China, and in doing so she is assisted by the methods she has adopted in closely cooperating with the Chinese. Germany always had many Chinese friends, both commercially and politically, and for the past three years they have jointly created sales and other organizations which have been the means of gradually restoring Germany's pre-war trade. It is undoubtedly a fact that most of the present German enterprise in China is an offshoot of the Stinnes syndicate, and the Germans are doing their business in such a way that competition amongst themselves does not exist. A surprising feature is their ability to finance most of the contracts they get and to give long credits —which the Chinese must have. As the Germans can no longer exercise extra-territorial rights in China they enjoy the same privileges as the Chinese, and in this way can own property anywhere in the interior. The Chinese law prevents the natives mortgaging their property to any foreigner enjoying extra-territorial rights, and under these conditions the Germans will benefit very considerably in the future. For instance, there are literally hundreds of such enterprises as mines, cotton mills, flour mills, electric light works, waterworks, etc. etc., which have already been organized, registered and sanctioned by the government, but have been unable to raise all the capital that is necessary to purchase equipment, etc. It is very often unsafe to sell machinery for such purposes on a system of extended credit unless ample security is provided quite apart from the equipment itself. This the Germans can and do get by an unqualified mortgage on the whole of the properties belonging to such a company.

"One often hears very pessimistic views about the inability of British manufacturers to compete with German prices, but most people forget that business in China does not always go to the lowest bidder. It generally goes to the firm from which the Chinese can get the best financial terms, and whilst in many cases a British merchant representing the manufacturer is willing to give easy terms of payment, he cannot obtain the sound security that he must have. There is not a single electric lighting scheme in China that does not pay handsomely, and most of them would yield even higher dividends if 'squeeze' were eliminated. In spite of this success there are hundreds of towns waiting for electric light and almost as many Chinese companies formed with a proportion of the required capital. These companies require the machinery on easy terms of payment, and the only people who can give it to them now are the Germans, who are willing to do so and take up debentures in the companies in lieu of payment. Arrangements can generally be made whereby a foreign chief engineer controls the operations of the company pending redemption of the debentures. In this way 'squeeze' can be reduced to a minimum.

"The question now arises: Is there a remedy for this state of affairs or are we to sit still and allow the Germans to capture the cream of the trade which we have had for so long? Nearly three years ago a charter was granted by the Chinese government to a group of British and Chinese interests which formed the Chinese-British Trade Corporation. Participation in this company was subsequently offered to British manufacturers through the federation of British industries, but it appears to have died a natural death through various causes. It is not too late to revive this company and out of it evolve a really workable organization. Under the terms of the charter it enjoys exceptional facilities for trading in the interior, and whilst it could not very well be used as a selling organization for a large and competitive group of British manufacturers, it could be used as a parent company from which workable selling concerns could be organized. The company, under its charter, has the right 'To finance, manage, undertake or participate in industrial and commercial enterprises of all kinds. To act as intermediaries or agents for the purchase or sale of securities, and for commercial and industrial business of all kinds. To deal in and hold stocks and bonds of all kinds.' It will be seen that many practical schemes can be evolved from such a charter, and now is the moment to re-open the question with the Chinese government."

* * *

Both of the above communications help to throw light on the present tendency of the machinery market in China. As pointed out by *The Times* correspondent, "*the name of a maker means little to Chinese purchasers, who know nothing of machinery.*" For the reason that that they have absolutely no conception of modern mechanical appliances, and there is no way to convey an impression of what they are for in their own language, engineering advertising in Chinese is practically worthless. For many years we printed all advertisements in Chinese in a supplement for circulation in China. We employed the very best translators and the supplement was printed at the very best native press in China. Difficult as it is to translate foreign mechanical words into Chinese or even give them a Chinese meaning, once done, it is impossible to translate them back into intelligent English. Many manufacturers had these advertisements translated back into English by some student or linguist in England and America, and in some instances insisted on having them withdrawn. The same situation still prevails and we come back to the statement that successful engineering publicity in China and in other parts of Asia, can only be assured through the use of English, which enables the manufacturer to reach the foreign-educated Chinese, who, at least, has some idea of what the advertising is about. When to this class, is added the foreign-educated Chinese engineer, the limit has been reached in successful engineering publicity.

Foreign manufacturers who followed an intelligent publicity program in China, have been rewarded by an enormous increase in Chinese business. These methods, combined with political conditions which drew the Chinese towards Americans during and immediately after the war, were reflected in the trade returns, which show that they furnished 54 per cent. of the business in 1920. As a contrast to the complaints of the British, the report of Mr. W. H. Rastall, chief of the industrial machinery division of the U. S. department of commerce, traces the influence of political conditions on this trade, and shows the growth in value of the American connection. Since this report was written, there has been a considerable falling off in machinery imports, and such business as is now doing, is going largely to German firms with inside connections with the Chinese. This situation goes to emphasize that sentiment has no place in the Chinese make-up when it comes to business, any more than it has in any other country, and that the trade will gravitate towards the nation whose firms

can quote the lowest price and give the longest terms of payment. The failure of the Chinese to pay for much of the material ordered two and three years ago, from American firms, must be considered in connection with Mr. Rastall's report. It is also worth while to point out that many of the American firms who entered the field in 1919-20, and to whose activities are due to a large extent, the piling up of these orders, have since retired from the field, Americans have almost returned to pre-war conditions in the representation of machinery manufacturers in this market.

Mr. Rastall's report also emphasizes a situation that we invited attention to two years ago, in which a large share of the machinery shipments imported into China and credited to Japan, originates in the United States. Branches of over sixty of the largest Japanese concerns in New York buying direct from the American manufacturer for consignment to Japan where it is transhipped to China, creates a trade situation that must be reflected in figures of direct trade between the United States and China. Mr. Rastall says:

" The progress made by American machinery manufacturers in developing export business and the superior position of American engineering equipment in the markets of the world are shown very plainly by the experience in China since 1911, as is illustrated very forcibly by the tables published herewith. It should be noted that these data are from Chinese and not American sources, being developed from the returns of the Chinese maritime customs.

" Conditions in China have differed radically from those in the other markets of the world because business there has been influenced very strongly by political forces, as has been called to public notice in connection with the armament conference. It has been customary to specify in loan agreements that the machinery required shall be purchased in the country furnishing the money, with the result that the United States supplied China only about 30 per cent. of the machinery it imported in 1918, as compared with 80 per cent. supplied in the same year to Japan, which is and has long been an openly competitive market. Consequently it should be recognized that the progress indicated below has been made in spite of the difficulties encountered by those who sell machinery in China without financial assistance.

" The customs authorities in China always credit consignments to the last port of shipment, so that machinery built in the United States and shipped to China via Vancouver would be credited as from Canada. In recent years very important amounts of machinery have been shipped in that way, in fact, practically all of the machinery leaving Canada originated south of the boundary. Similarly, it should be remembered that the shipments from 'other countries' include not only machinery from Germany, but important shipments from Holland, Belgium, Sweden and other sources, although in the period prior to 1914 Germany was the most important of these sources of supply. The progress made shows a most astonishing increase in the volume of this business, making it worth while to submit the following figures showing the value of the shipments of the leading countries. These values are given in haikwan taels, the exchange value of which fluctuates very seriously, being worth about 65 cents in 1911, $1.03 in 1917, etc. :—

Value in Haikwan Taels of Machinery Imports into China (excluding Agricultural, Embroidery, Knitting and Sewing Machinery.)

Year	United States and Canada *Taels*	United Kingdom *Taels*	Japan *Taels*	Total from all sources *Taels*
1911	382,054	2,330,209	465,122	6,561,020
1912	179,803	1,762,916	388,475	4,704,485
1913	673,227	3,241,590	548,522	7,137,048
1914	681,170	3,749,149	852,934	8,157,270
1915	659,722	1,994,518	851,185	4,485,867
1916	1,078,530	2,350,903	1,991,031	6,131,258
1917	1,411,141	1,648,869	2,419,813	5,982,715
1918	2,390,332	1,313,604	3,569,909	7,860,290
1919	6,407,727	2,073,968	3,604,905	14,328,249
1920	12,181,382	5,229,026	3,727,604	22,536,254

" From the foregoing table it is evident that American machinery exports to China have increased 3,100 per cent. since 1911, and the American share of this business has increased from 5.8 per cent. (the lowest of the countries here mentioned) in 1911 to 54.1 per cent., or more than all others combined in 1920.

" Even this statement does not adequately describe the situation, because American machinery transhipped in Japan, especially for point in North China and Manchuria, is credited to Japan in the returns given in the table. Unfortunately, it is not possible to submit figures to show the volume of this transhipment business, but there is reason to believe it is very large, and during the war was strongly influenced by the demand in Siberia for war equipment.

" What has just been stated refers to the experience covering all classes of machinery. If it is desired to be more specific, it is possible to submit corresponding charts regarding particular classes of machinery and a record of Chinese imports of textile machinery. For Americans the interesting part of the table is the comparison between the experience of the United States and the United Kingdom in this trade. The superiority of American engineering as represented by cotton-mill design and cotton-mill equipment has been clearly recognized in China, as also certain other countries, and it is anticipated that European designs will soon incorporate certain American features. The values involved in this trade are as follows :

Value in Haikwan Taels of Textile Machinery Imports into China.

Year	United States and Canada *Taels*	United Kingdom *Taels*	Japan *Taels*	Total from all countries *Taels*
1911	7,161	241,234	60,159	331,582
1912	9,885	307,283	50,229	458,615
1913	2,615	672,150	112,500	839,724
1914	2,530	1,540,100	187,661	2,038,460
1915	15,446	1,076,229	253,490	1,419,511
1916	115,431	1,257,961	531,437	1,934,141
1917	218,928	669,649	302,607	1,235,800
1918	379,867	669,402	642,948	1,714,994
1919	1,944,350	813,254	897,760	3,767,406
1920	3,897,204	1,925,696	1,071,201	6,927,728

" It is thus very clear that the textile industry in China is growing very rapidly, and the American interest in the trade is making even more rapid progress."

* * *

Up to Northcliffe

THE *North-China Daily News* has an uncanny habit of unearthing documents disclosing the inner working of Russian policy in Asia. Many years ago it set the chancelleries of the world agog by publishing the text of the Cassini convention, a document which changed the whole aspect of Asiatic politics and compelled Great Britain to move quickly in order to defend her interests in India and elsewhere in Asia. The aftermath of this convention and its corrolary, the Li-Lobanoff secret alliance between China and Russia, was the Anglo-Japanese alliance, the Russo-Japanese war and the series of events which culminated in the twenty-one demands followed by the diplomatic blunders which nearly precipitated war between Japan and the United States.

Once again our contemporary publishes an epoch-making document, purporting to be the full text of the secret military convention between Soviet Russia and Republican Germany. As in the case of the Cassini convention, the authenticity of the document is in doubt, but it bears the earmarks of truth. In the event of its authenticity being established, history will undoubtedly repeat itself and Great Britain again make quick moves to counteract it, and unless we are greatly mistaken, the first of these will be a renewal of her discarded understanding with Japan.

By the terms of this secret agreement, Germany will equip, arm and entirely reorganize the Russian army. The German general staff will furnish the red army with the latest inventions in poison gas warfare, will build and equip new munitions and

aircraft factories, *and the reds are not to interfere with the work of German officers and specialists on the new munitions factories on the border of Afghanistan.*

No competent observer can fail to see that the reported secret convention is the logical aftermath of the Soviet's first surrender to Germany, and is strictly in line with the news that has dribbled out of both countries for the past three years.

History is being made while we write about it. It is safe to predict that the time is not far distant when those who were so active in discrediting Japan and bringing about the cancellation of the Anglo-Japanese alliance, will acknowledge the error of their ways. The Russo-Germanic pact leaves nothing to the imagination. It is now pertinent to ask; What will China be doing while Germany is building munitions factories on the borders of Afghanistan and developing the mineral wealth of the Altais and the Pamirs? What guaranty can China give to Great Britain that her territories in Tibet will not be violated when the time arrives for this new combination to place its plans in operation? Will the armies of Wu Pei-fu or some other Chinese general step into the breach and hold the new combination in check? When the time arrives, will those who defamed Japan, call upon her to come to the rescue?

The time may not be far distant when there will have to be a showdown on these matters. It is hardly probable that Northcliffe favors the new Russo-Germanic combine, and might tell us frankly how he expects British interests in Asia to be protected.

What is Japan supposed to do during the development of this new game of empire? Is Northcliffe willing to admit the danger to British interests in India, Persia and elsewhere in Asia? Will he frankly acknowledge that China is powerless to protect even her own integrity? Then he must be equally honest in expressing views about the necessity of Japan maintaining an army sufficient at least to guaranty her own independence. And if, in the development of the Russo-Germanic program in Central Asia, Britain's position in India and Persia is again menaced from the north, perhaps Northcliffe will be equally frank and honest in explaining just how big an army Japan will then be justified in maintaining?

Secretary Hughes has very firmly placed on record the American attitude towards the Soviet. The position of France accords with that of the United States. If the time ever arrives when Great Britain is placed with her back against the wall, there will be little sympathy wasted on those who by isolating Japan made possible such a calamity. The force of public opinion has influenced Japan to withdraw her forces from China and the Asiatic mainland. It may be a most difficult matter to persuade her to again set her legions in motion.

If this new alliance works out as they plan, there will be no combination capable of holding it in check except the Anglo-Saxons acting in concert with France and Japan. To quote the *Rochester Post Express*, "the next few years may see the government at Washington converted to the policy of permitting and encouraging the Japanese to occupy and hold Eastern Siberia against the German-Slav colossus and keep it out of China until that country is unified and able to defend itself." And the first to acquiesce in and urge such a policy will be those who have most active these past few years in discrediting Japan.

* * *

A big financial corporation has been organized by nearly forty leading companies of Germany, with the official approval and sanction of the central Soviet administration in Moscow, for the development of Russian industries. The capital of the corporation is temporarily fixed at one milliard gold marks, but it will be increased considerably in accordance with the commercial and industrial requirements of the vast Russian Soviet republic.

* * *

A remarkable organization for the promotion of German enterprise in Siberia has been created by the constitution, which is reported to have taken place at Vladivostok at the beginning of February, of the Far Eastern Russian-German economic association at the premises of the local chamber of trade and industry.

According to the details furnished by the promoters to the Vladivostok court of registration, the object of the association is to promote economic relations between German and Russian commercial and industrial circles, to establish regular business relations, and pave the way towards the productive combination of capital. It is proposed to establish exhibitions of samples of merchandise, prepare and extend lists of responsible firms, collect statistical data, give information of all kinds, endeavor to secure the re-introduction of patents and trade-marks, settle disputes, etc.

* * *

The American Minister

IT was only natural that the clear-headed practical statesmen directing the present administration should live up to the standards set at home and select for the Peking post, a man worthy of the best traditions of the American diplomatic service. Seven years of futile sentimentalism, of batting around from pillar to post, of trying to accomplish the impossible, brought about a serious breakdown of American diplomacy in the Far East. The task of re-shaping American policy in this part of the world was one calculated to test the highest statesmenship of the nation.

Harding and Hughes rose to the occasion. The selection of Wood as governor-general of the Philippines, Warren as ambassador to Tokyo and Schurman for the Peking post, carried the promise that the days of sentiment had passed. With these three trained executives on the ground advising and collaborating with Washington, the president and secretary of state were enabled to re-shape American policies without sacrificing their essentials, and bring about a peaceful and satisfactory solution to the Pacific problems at the Washington conference. The days of hammering out and forming policies for action at the legations are gone. The tail no longer wags the dog. We have returned to the rational system of having national policies laid down by the state department and of appointing representatives who can be trusted with carrying them out for the ultimate benefit of purely American interests.

Jacob Gould Schurman is proving himself equal to the task he is expected to perform and has earned not only the commendation of Americans in China but the appreciation and good-will of the Chinese and his colleagues in the diplomatic corps. In swinging around the circle, visiting all the consular districts in China and gathering a first-hand knowledge of the problems that confront American trade, the American minister to Peking has equipped himself for real efficiency in his job. Americans feel that once again they have a champion whose opinions are not influenced by advisers in Peking working to have their own pet schemes given a monopoly of official support. In the short space of one year, the influence of the new minister has worked a marvellous change, and Americans throughout China are being brought together in a spirit of harmonious co-operation for the general advancement of national interests, a situation that seemed impossible of achievement two years ago under the partisan, and at times, arbitrary methods permitted under the past administration.

It is not our purpose at this time to write a eulogy of Minister Schurman. His reputation as a diplomat and statesman rests on a more secure foundation than his short tenure of office at Peking, where the first job he and his superiors had to tackle was the difficult one of finding a way out of the Oriental political labyrinth into which we had been led and abandoned by others. We are out of it at last, thanks to our new guides. The policies of the former incumbent of the post had so effectively closed the door against independent American financial activities in the development of China, that the only way we could participate at all was through international co-operation. The last administration created the new consortium in order to divert attention

Hon. JACOB GOULD SCHURMAN
American Minister to China
From a Sketch by Joel Madsen

from its own mistakes. It will tax the genius of the present administration to make it work.

Much has been accomplished since the new administration started in to straighten out the Far Eastern tangle. We are once more out of the woods and our feet planted on firm ground. Our guides have proven their worth, and we can look forward with greater confidence that these same leaders will find some way out of the consortium tangle that will once more elevate American diplomacy to its old time practical efficiency.

* * *

The New Pacific "Entente Cordiale"

THE finest accomplishment of the present administration is the four-power pact. Signs are not wanting that the results of the Washington conference and the present trend of world politics will bind America and Japan more firmly together as time goes on. The Russo-Germanic combination is certain to have its effect upon the vital interests of Japan, and whatever differences of opinion may have strained American-Japanese relations in the past, these will disappear and Americans once more unite to morally and materially support the plucky island empire in whatever steps it may deem necessary to take in order to defend itself against such a formidable menace. Only good can come from such understandings, and these are being facilitated by such visits as that of the U.S. naval class of 1881 to Japan to hold their annual re-union as the guest of Admiral Uriu, a member of that class.

These visits will do more to restore good-feeling between the two nations that the usual exchange of high-flown oratory on the part of politicians. Much of the ill-feeling engendered between Japan and America was the direct outgrowth of agitation by politicians for political purposes. When soldiers and sailors, the fighting men of nations, get together in friendly re-union, it is a difficult matter for the politicians to start trouble. Men who to do the actual fighting are more likely to appreciate each other's qualities and become friends than political antagonists who use each other for selfish advancement. A few months since, General Tanaka visited General Wood at Manila. In return for the honors and decorations conferred upon General Wood and his party when they visited Tokyo, the American government conferred the distinguished service medal upon General Tanaka, to be presented while he was in Manila. The medal failed to arrive in time, and in making the formal presentation, General Wood explained the situation and taking off his own medal, pinned it on the breast of General Tanaka, saying that when the one intended for him arrived he would wear it himself. This delicate compliment did more to bring about friendly relations than years of official diplomatic correspondence. Tanaka returned to Japan enthusiastic about his reception and eulogistic in his praises of Wood. Tanaka says that Wood will be the next president of the United States.

In line with this fine feeling of comradeship, is the invitation of Admiral Uriu of the Japanese navy to his fellow-members of the class of 1881 at the Annapolis Naval Academy, to visit Japan this summer as guests of the Japanese government at a re-union in Tokyo. The cordial relations that are bound to follow will be far-reaching. If the fighting men of Japan and America occupy themselves with the relations between their two countries, their influence will neutralize that of professional agitators and trouble-makers, who, in both countries, have been far too active in recent years.

Nothing expresses American sentiment more clearly than the message of President Harding sent through the state department to the America-Japan Society on the occasion of the dinner at Tokyo in honor of the Japanese delegates to the Washington conference.

In commenting on this *The New York Times* says:

"The Japanese delegates acquitted themselves handsomely at Washington and enhanced the prestige of their country. They had made thorough preparation to discuss the articles of the agenda. They brought will them a well-informed staff of specialists. Feeling themselves suspected of Oriental dissimulation to gain their ends, they disarmed criticism by frankness and by moderation. There was a dignity in their demeanor that commanded respect.

"No delegation showed more tact than the Japanese, and their courtesy was proof against misapprehension. It was their custom not to commit themselves without notice that Tokyo had been consulted. At all times they were scrupulous to be understood, and when they took a position, as when they made a stand for the warship *Mutsu*, they were ready to agree to compensations. In short, the ability and discretion of the Japanese were a revelation to their critics. So it is just as well as courteous that Secretary Hughes should have said for the president in the message to the America-Japan Society which was honoring Prince Tokugawa and his associates:

> Highly appreciative of the great interest taken by these gentlemen in the success of the conference, the president would wish that he be permitted to share in the occasion by making through me his own acknowledgement of their sympathetic co-operation and of the considerate and accommodating spirit with which they participated in the many difficult questions confronting the conference.

"Previous to the Washington conference, talk of an *entente cordiale* with Japan would have had a ring of insincerity, but the spirit and the success of that historic meeting have brought about an improvement in the relations of the two nations."

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The China Trade Act

A Nigger in the Woodpile?

THE honorary secretary of the American chamber of commerce of China has been retained in Washington for sixteen months by the American business community of Shanghai for the purpose of pushing through the act providing for federal incorporation of American companies operating in China. Shortly after his return to Shanghai, the following editorial appeared in the *Weekly Review of The Far East*, of which the honorary secretary of the American chamber of commerce of China is editor and publisher:—

"American business in China has developed very rapidly since the beginning of the European war and, in some instances, has suffered from over expansion to such an extent that the present depression is causing embarrassment in many quarters. There have been elements of competition which have served to injure the whole American business position in this great overseas market. Every experienced American business man in China knows that the failure or withdrawal of one American firm of promise from this field not only injures the individual firm affected, but all American business in this part of the world. It is a matter of common knowledge that unfair competitive practices on the part of one firm injures not only those in the lines affected, but also all other lines of American business. Fraudulent practices on the part of one firm injures all, and worse, tends to bring all American business both domestic and foreign into disrepute in the eyes of other nationals. Competition for the trade of China is becoming keener and is tending to become national rather than individual. It is not our intention to advocate a trust, for this would be impossible of organization or operation, but all will agree that there should be co-operation and co-ordination. That, at least, would remove the worst features of destructive competition. Some may suggest that this work of co-ordination should be handled by certain American govermental organs represented in the field, but this is difficult of accomplishment under the American democratic system, and would eventually cause congressional criticism. The job should be handled by the American business and financial interests themselves through some form of organization that would tend to eliminate objectionable features of competition without repressing individual initiative and effort. We admit that it would be a real job to bring this about, but there is always the right man for the job providing the place is made sufficiently attractive. After the right man has been found, he should be able to prove his worth and the general saving which he would be able to bring about would make his salary a mere incident, even though it reached the magnitude of that received by Mr. Hayes from the movie interests."

We can be excused for wondering what all this was leading up to. It was interesting to speculate upon the personality of this representative of non-competitive American business interests who would reside in Washington and practically dictate American policy in China. The casual reference to the salary of Mr. Hayes, the head of the movie trust (a mere bagatelle of $150,000) opened our eyes to the possibilities of such a job and we have waited for further enlightenment on this brand-new idea. When the honorary secretary of the American chamber of commerce of China, made a speech before the American chamber of commerce at Tientsin, we were still puzzled to understand the meaning of the following statement:—

"**There is not a soul in congress to plead the interests of business men in this part of the world. It would be worth many times the cost to have such a man on hand in Washington to represent American interests out here.** Some of the wildest arguments are advanced in congress

about products from China and there is no one on the ground to dispute them. For example, one congressman made a long speech about disease in products from China. He built up a fine structure of argument based entirely on bunk. Interests having millions at stake in these matters have absolutely no one to represent them in Washington."

We scented a nigger in the wood-pile, and waited to see just how and where the Etheopian gentleman would show himself.

At the annual meeting of the American chamber of commerce for China its honorary secretary read a *résumé* of the amended Act as it would pass both houses and be signed by the president. Amongst other clauses was one which read *"that at least one director of a China trade act corporation must reside in the district of Columbia!"*

Examination of the act discloses that the "number, qualifications and manner of choosing and fixing the tenure of office and compensation of all directors of these China trade act corporations shall be fixed in the by-laws of the corporations themselves. In other words, each company may fix its own qualifications for directors, and with the law providing that one director shall reside in the district of Columbia, it means that the usual qualifications surrounding the election of directors will have to be materially modified. Naturally, no one company could afford to maintain a director resident in the district of Columbia, so if the law is to be complied with, several or many companies would have to combine to pay the salary and office expenses of such representation.

As matters stand, there are few individual American companies in China who could legitimately bear the expense of complying with this clause in the new law but it might not be difficult to follow the hint conveyed in the editorial appearing in the *Weekly Review of the Far East* and organize a group of non-competitive interests which could pay an interlocking director a salary commensurate with that received by the head of the movie trust. Granted that this can be done within the law, how about the outsider, the competitor who attempts to buck this combination with its $150,000 a year director resident in Washington? Is this what the honorary secretary of the American chamber of commerce means when he advocates removing the worst features of destructive competition? Might not the elimination of objectionable competition include newspapers? We don't know how this phase of the clause appeals to other American firms in China, but we fully understand how the system might work in connection with our own business.

It would seem that hidden away in this clause of the China trade act lurks a fat job for one or two representatives of American trade interests resident in Washington, who would wield immense power, which could be employed very effectively against objectionable competitors.

There may be no connection between the editorial in *The Weekly Review of the Far East*, the speech of the honorary secretary of the American chamber of commerce at Tientsin and the clause in the China trade act providing for a resident director in the district of Columbia. It is difficult, however, to dissociate one from the other.

It is quite conceivable that such a plum will never be handed out to any ordinary individual, much less any American resident in China. It will be a big job and will go to some legal light whose knowledge of China is nil but whose political prestige in Washington is great. The China trade act provides that all corporations organized under its provisions may sue or be sued in the supreme court of the district of Columbia, thus making the director resident in Washington, for all legal purposes, a head officer of the corporatiou he represents. Naturally, such a personage cannot be bothered with details. He will require expert advice and guidance. The real head of the combination will be an assistant having a most intimate knowledge of the inside working of American business in China.

The main features of the China trade act will materially advance American interests in China. It should be enacted into law. The clause providing for resident directors in the District of Columbia, however, opens the door to the creation of a favored combination whose power can be exerted to crush or stifle competition. With a full knowledge of how such power can be used, THE FAR EASTERN REVIEW will watch with considerable interest the working out of a clause which facilitates such un-American practices.

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The Situation in China

CHINA has passed through its seventh revolution in ten years, and from out of the wreckage emerges Wu Pei-fu as the new military dictator of Peking. A traitor in the army of Chang Tso-lin gave the initial victory to the forces of Wu in the north and the betrayal of Sun Yat-sen in the south gives the finishing touch to a campaign which elevates Wu to the top-most rung of the Chinese military ladder. Wu declares that his great aim is the unification of the country, the abolition of the *tuchunate*, to put an end to internal strife and the destruction of property and bring China back to the ways of peace. His praises have been sung daily by a chorus of Peking correspondents, and the world educated to look upon Wu, as the "Hope of China."

"The Hope," however, seems to be only one more in a band of *tuchuns* who have openly robbed the government and people for their own ends. Wu Pei-fu followed the precedent of Chang Hsun, but has been luckier than Chang in that he was early impressed with the value of publicity and of having a number of foreign writers on his staff of advisers. When Wu placed his army astride the Peking-Hankow Railway at Chengchow and exacted toll from its revenues and collected the salt taxes, in the same manner as Chang Hsun straddled the Tientsin-Pukow line at Hsuchowfu in earlier days, he was exonerated by the claque, because, as they explained, his intentions were good. Wu, they said, was a real patriot, resorting to these illegal methods only because the wicked government at Peking refused to supply him with funds. Wu was, therefore, justified in maintaining his army in order to drive the rascals out. The end justified the means.

Now Wu Pei-fu may be all that his press agents would have us to believe him to be, and if he can live up to the reputation set for him by admirers and maintain his ascendency, the chances seem bright for the rebirth of a benevolent military dictatorship on the lines of the one created by Yuan Shih-kai.

However, notwithstanding the reports of brilliant victories and the serene confidence of the small cheerful circle surrounding General Wu Pei-fu, it is becoming more and more evident that peace and unification are as far off as ever. From all accounts, Chang Tso-lin is still to be reckoned with, and as long as he sits tight in Manchuria there is little hope that the power of Wu Pei-fu will materially change the situation. Instead of being dictated to, Chang Tso-lin is in the position of dictating to Peking. Chang has advanced an argument difficult to ignore. When he talks about self-determination of the Manchurian provinces he is in a position from which he can only be moved by force of arms. His army is more or less intact and his financial resources remain as sound as ever. While Peking is at its wits' end seeking funds, Chang still has his group of Manchurian banks which can provide him with $50,000,000 when necessary. Wu has proven himself a good soldier, but his ability as a statesman and administrator remains to be tested. His own party is split asunder and the members of the parliament swarming into Peking are reviving the tactics of other days, and seem determined to have things their own way in regard to posts and emoluments. It is entirely too early to assume that China is out of the woods, despite the optimistic statements of the small cheerful circle which surrounds General Wu and whose reports constitute the basis of most of the current news articles emanating from Paotingfu.

It is difficult to ignore current reports that Wu Pei-fu has the support of this or that legation, and that the ground is all prepared for the issuance of a great refunding loan, which, amongst other things, will consolidate his power in the same manner

that the reorganization loan of 1913 seated Yuan Shih-kai firmly in the dictatorial saddle. Such a loan might accomplish this end, but it would not consolidate China.

Until such time as a proper constitutional government based on a recognition of provincial rights and a limitation of the central authority is established, dictators will come and go and the nation or nations who finances any one military overlord, will learn to their sorrow that they have backed the wrong horse. The mere fact that any one dictator is supposed to have the support of any particular foreign government is sufficient to set all other interests intriguing for his downfall. A *régime* which starts in by hounding out of China the two brainiest financial leaders of the country, who, no matter what their faults may be are true to type, no better or worse than their accusers, and which eliminates Sun Yat-sen by base treachery, cannot hope to inspire full confidence in its ability to perpetuate itself. If unification is ever to come to China, it cannot be made permanent by ignoring the man who stands for ideals which lie at the very foundation of successful constitutional government in this country. Nor can the Chinese nation be unified by the use of the armies of any one *tuchun*, super, ordinary or otherwise.

North-China Daily News

Wu Pei-fu, drawn by Juel Madsen

Had Chang Tso-lin emerged victor from the fight in Chihli, he might have staggered along for a few months or a year under the charge of being in the employ of Japan. Wu Pei-fu may last as long or longer, but if current stories have any basis in fact, he also, in the end, will have to go. When any one foreign minister or financier cherishes the illusion that the dictator of China is safely tucked away in his vest pocket, that particular dictator's tenure of power will be short indeed.

The Chinese have milked the foreign financial cow dry. Japan has been milked for many millions, If reports are true, Uncle Sam has also contributed $50,000,000, which cannot be collected. Indications now point strongly to the intention of Peking to bestow its affections upon the British. It may be true and it may be false, but whether true or false, the Chinese will learn that there will be no altruism in any loan obtained directly or indirectly from British sources. The money, if lent, will be expended for the purposes for which it is intended, carefully supervised, and audited and the revenues for its security safely earmarked against any possible attack of aphasia on the part of future officials. Loans from England have their advantages. They are certain to be productive and create markets for materials.

"Playing Uncle Sam for Sucker"

This phase of the Chinese situation leads up to a brief reference to the series of articles entitled "Playing Uncle Sam for a Sucker" now appearing in *The Weekly Review of the Far East*. In this indictment of China, stress is laid upon the failure to pay her legitimate debts to American manufacturers for materials delivered, while making every effort to satisfy Japanese and European creditors.

There is only one observation we care to make on the situation described in the columns of *The Review of the Far East*, and that is, if the Chinese are playing Americans for suckers, the responsibility must be shared in large part by Mr. J. B. Powell and his co-workers, who, under the leadership of ex-minister Reinsch, started the campaign to flood the Chinese field with American firms in order to skim off the cream while the skimming was good during the Japanese boycott, and to build up an American business community in China whose mere weight of numbers would swing business to American manufacturers. We had occasion last year to invite attention to the disastrous consequences of this hip-hip-hurrah ! method of advancing national interests in China, and to quote the commissioner of customs who officially declared in his annual report that the influx of a large number of inexperienced foreign firms into Shanghai precipitated the catastrophe which nearly ruined every trading firm in this port. American firms cannot be held responsible for responding to the official propaganda to induce them to enter the field.

Some time last year Mr. Guy W. Walker, a most rabid anti-Japanese propagandist, proposed to President Harding in a letter which we commented upon at the time (July, 1921) that the United States government take over all of China's bonded indebtedness to other powers in payment of an equal amount of what the allies owed to America. In other words, the United States was urged to become the sole creditor of China after which we were to question the validity of loans made by Japan and denounced as inimical to China's interests.

This proposition was very properly ignored, yet during the progress of the Washington conference it was again revived, this time by Mr. Thomas F. Millard. The newspaper comments on this scheme constituted the only reference to Mr. Millard's activities during the conference. It is difficult to dissociate Mr. Millard from the publication which still bears his name. It is appropriate, therefore, to invite attention to a scheme, which, if ever carried out, will place the United States in the position of being the biggest sucker that ever existed. If China is not promptly meeting her obligations to American creditors, who is to blame, the Chinese, or the people who led them to believe that Americans would fight their battles for them and relieve them of all financial indebtedness to other powers.

The Chinese are making it difficult enough for Americans to support their policies and create a sentiment favorable to the flotation of any loan on the American market for their financial relief. They certainly are not playing the game as Americans understand it, but they have the right to feel peeved when the Millard Publishing Company accuses them of playing Uncle Sam for a sucker after having led them to believe that the United States government

might be induced to manipulate a deal which would relieve them of all outside financial indebtedness.

Japanese-American Co-operation

As mentioned above, constant propaganda has created the impression that in some way or other, not fully explained, the British group in the consortium will either take the initiative in negotiating a refunding loan or operate independently in financially supporting the Wu Pei-fu *régime*. It has been difficult to reconcile these reports with the consortium understanding, and, if true, would indicate that the British group was prepared to go it alone. There is nothing to prevent such a loan, if the other groups decline to participate. We have refused to give credence to these reports believing they were simply expressions of wishes that were father to the thought, proof in our mind that Peking had come to the end of its financial rope, and was now endeavoring through subtle propaganda to create dissentions amongst the banking groups that would lead to a cancellation of the consortium agreement.

The situation seems to be that China can expect no assistance in the shape of independent loans from Japan. The Japanese are not likely to play the financial fool for the sake of bolstering up any temporary dictator in Peking. The Chinese have exhausted their credit in Japan. Over $50,000,000 are owed by China to American firms, and those who have reposed the blindest faith in her honor are hit the hardest. We quote from *The Wall Street Journal* of November 4, 1919, when the original Continental and Commercial Trust Company loan to Peking was placed on the market for renewal. Mr. J. J. Abbott in an interview given out in Chicago, said :

"I would trust China without any security, but it has been the custom of that country to supply such protection."

Coincident with the above declaration of absolute faith in China's financial honor, Dr. Paul S. Reinsch arrived in the United States to enter upon his duties as chief adviser to the Chinese government. In one of his first interviews on arrival at San Francisco as reported by the Associated Press on October 23, 1919, he declared :

"And remember, that China is one of the very few big powers which is absolutely solvent and can pay for what she buys with spot cash if she so desires."

Can American business men be censured for taking these leaders of finance and diplomacy at their word ? Is it any wonder that the warning of lesser lights was ignored when such propaganda was put out to induce Americans to "invest in China" and get aboard the band-wagon that was then being paraded up and down the cities of the United States, heralded by a brass band of newspaper publicity, such as was never given to Barnum in his palmiest days ?

At the time, we strongly denounced such broad statements, calculated to unduly enhance the credit of a government existing solely for the purpose of finding funds to perpetuate the rule of rapacious *tuchuns*. Over two years have passed. Mr. Abbott's loan came up for payment in November last. The interest and principal was defaulted. Manufacturers of railway and other materials accepted Minister Reinsch's declarations at their face value and eagerly booked orders the Chinese forced upon them. They are now whistling for their money. The pendulum has swung the other way. China's credit in the United States stands below zero.

Business conditions in China are worse than ever. In commenting on this phase of the situation *The North-China Daily News* says :

"Merchants of wide experience in Shanghai make no secret of their opinion that not even in the strenuous days of the revolution did matters come to such a pass as at present. Ships arrive in port bringing valuable cargoes, but the Chinese dealers who act as the purveyors for the interior are unable to put their cargoes into consumption. They must be warehoused here or elsewhere, eating up money through interest charges and perpetuating the dislocation of trade. No ray of light appears to penetrate through the gloom, nor will there be until Peking effects such a settlement as will promote confidence sufficient to trade on.

So much for the needs of private business. The business in which the government itself is interested deserves equal consideration from those consulting on affairs of state, for in different parts of the world manufacturers and engineers must be paying unusual attention to Peking's capacity, or lack of it, for ordinary business affairs. The contract for the Yellow River Bridge was awarded a considerable time ago, and since then nothing has happened. A firm in Europe was recently given the work of constructing a number of locomotives for government railways, and progress has now been made thereon to the point where the first instalment of money can be called for. An unhappy rumor is current in the capital that it is not forthcoming. Only the other day the contracts for the Peking tramways were announced, but people regard the whole project sceptically : in the present condition of things they believe the trams are hardly likely to be seen for many a long day."

With the financial markets of Japan and America barred against independent Chinese loans, it was only natural that the latter should start a flirtation with the British. But the British many ages ago graduated from the kindergarten class in these international financial matters, and while they may smell around, nibble and investigate, they are too wise to swallow the hook and be landed in the Chinese net. If there is any sucker to be caught, it will not be hooked in the Thames.

Present conditions indicate, that sooner or later, the Chinese must come to the consortium for relief. If, however, current reports should prove true, and British money is loaned to Peking directly or indirectly, it is not very difficult to prophecy the future.

It is preposterous to harbor the idea so carefully propagated, that the British will come to the financial rescue of Wu Pei-fu, but if the incredible should come to pass, a similar unbelievable situation would surely follow. Japan and America would be brought together in a co-operation so harmonious that it would materially change the entire situation in the Far East.

* * *

Keeping Peace on the Pacific

Cheap Radio Essential

ELSEWHERE in this number of THE FAR EASTERN REVIEW will be found articles dealing with the Pacific radio situation and the growth of radio activities in Japan. Since the first article was written we learn that the service of the U. S. naval radio for press dispatches is to be continued until July, 1925. It seems unfortunate that this service to the Pacific press cannot be made permanent, as the commercial cable and radio rates between Pacific countries are prohibitive to the sending of any press dispatches save those of the most sensational character. We agree with the Pan-Pacific union that a six-cent a word press rate to any part of the Pacific via government radio would have meant the assurance of continual goodwill, which for the next ten years, is a guarantee of permanent peace in the Pacific.

Spurred on in part by these low radio rates, the United Press is entering the Pacific field and hopes to loop up a news service between all Pacific lands. Unburdened by any contracts with European press services to keep out of any Pacific territory the United Press has a free hand. It is understood that a drop service will be established at Honolulu where it is proposed to gather and disseminate radio press messages from and to every part of the Pacific.

With so much money being expended in the United States to keep the people amused and informed by free radio broadcasting, it would seem that some attention might be given to a service upon which depends to such a great extent, American trade and prestige in the Pacific.

The United States government from its army and naval radio stations sets free daily wonderful musical compositions that anyone, amateur or professional, may receive and listen to if he but has a wireless outfit or access to a receiver connected with one.

The U. S. government serves the press of the American Pacific with news sent out through its naval raio stations at a minimum cost. Should the other governments of the Pacific be willing to

reciprocate, a six-cent a word press rate could and would be established between any two countries of the Pacific. Such a press rate now exists between San Francisco, Honolulu, Hawaii, Tonga, Samoa, Unalaska, Alaska, Guam and Manila. The result was that Honolulu on the most isolated group of islands in the world, received and published daily the full proceedings of the great conference in Washington. There was no misunderstanding.

Japan, China and Australasia refused to receive the radio press messages distributed by America, with the result that often dispatches during the conference were days late in transmission and on several occasions so garbled as to almost bring about international misunderstanding.

From Washington it cost six cents a word or less to get news to Honolulu or Manila. It cost from thirty to sixty cents a word, press rate, to get news to Japan, China or Australasia, and this was practically a deferred rate, subject to a delay of twenty-four hours or more. It cost triple commercial rates, or from one to three dollars a word to get quick cable service to the Orient or Australasia.

At Guam when six cents a word press messages were received, these might be relayed by government radio to Manila, but the messages destined for Japan had to be taken by auto across the island to the Japanese cable office to go over a congested cable.

It was hoped that during the Washington conference all this would be adjusted, and at one time there seemed to be every hope that it would be. Now it is necessary for the Japanese and American ambassadors to get together and suggest an amendment to our treaties that will permit Japan to receive and send press messages to and from her government radio stations.

It is because of these unfortunate restrictions on the free and unhampered distribution of news between Pacific lands that the Pan-Pacific union of Honolulu is urging that each government send a delegate to the next conference who is well posted on communications. As it is now only sensational items are sent at the present high and all but prohibitive press rates that exist because of the lack of understanding and co-operation.

The Pan-Pacific union believes that the governments of the Pacific can safely be trusted to set free daily authentic news of the happenings in their respective countries. At any rate this subject might well come up for expert discussion at the Pan-Pacific commercial conference next October.

Here is a proposition that should meet with the unqualified approval of every American in China and Japan, the assurance that through cheap communications for press publicity friendly relations may be perpetuated with all Pacific countries. If millions can be expended for amusement and advertisement at home, some attention ought to be given to the more serious needs of trade and future relatons with China and Japan. It is to be hoped that the branches of the Pan-Pacific unions in China and Japan, the American chambers of commerce and other bodies will get behind Alexander Ford at Honolulu and work for the success of such a worthy program.

For a Better Consular Service

ACTIVITIES of the diplomatic and consular services in behalf of American business interests were described by Secretary of State Hughes, in an address at the concluding session of the annual convention of the chambers of commerce.

The state department and the department of commerce, Mr. Hughes said, are co-operating in their activities in a most satisfactory manner.

"I shall make no apologies for asking not only your support but your active and urgent demand in the interest of American business for the maintenance and development of the most efficient organization of our diplomatic agencies," said Mr. Hughes. "The truth is that our foreign service is undermanned and underpaid. Of course, in the department of state, as in other departments, we are most deeply interested in economy and reduction of unnecessary expense. At this time with vast burdens resting upon our people as a result of the war, all avoidable outlays should be rigorously cut down and the department of state has done its full share. Let me call attention to the fact that the expenses of the entire service of the department, including the diplomatic and consular services and that of the department in Washington amount to less than $11,000,000. Indeed, under the present schedule of passport fees, which I shall be glad to see revised and reduced, for the last fiscal year the receipts of the department exceeded the total expenditures of all services by over $1,270,000. In other words, it was a money-making institution. I am not, therefore, asking outlays which threaten the taxpayer with any serious increase of his heavy burden. A relatively small amount would be sufficient to give the equipment that is needed to provide the essential basis of a career and thus to keep trained men in the service of the government.

Diplomacy and Commerce

"There has long been too great a distinction between the political interests of the diplomatic service and the commercial interests of the consular service. Both are engaged in political work and both are engaged in commercial work. You cannot at this time take economics out of diplomacy. If you would protect your interests on the one side you must support them on the other, and I believe that the two branches of the service, now called the diplomatic and consular, should be drawn together and treated as an interchangeable unit. This would permit men to be assigned from one service to the other and thus give a greater range of opportunity for putting men in the places where they belong, as their aptitudes and special talents are revealed.

"In all these matters we must be realistic and not permit our mental processes to be stopped by archaic differentiation. Nearly all nations have found it necessary to make a considerable reorganization in order better to equip their foreign service, and this country should not lag behind.

"There should be a co-ordination of effort among the different departments of government. Sometimes it might be supposed that the different departments of government were so many different governments, such has been at times the nature of the intercourse between them. While we are intent upon perfecting any particular agency of government we can never afford to lose sight of the fact that it is a single government whose varied instrumentalities we are considering and which must act as a single government with a unified purpose and method.

Departments Co-operating

"I am glad to say that we are achieving at this time a very gratifying measure of co-operation among the departments; in particular the relations between the department of state and the department of commerce are most cordial and mutually helpful. We are working with each other and endeavoring each to aid the other in its recognized field of effort. It is my most earnest desire that all practicable measures shall be taken to promote American commerce and disseminate through all appropriate channels the essential information which the American merchant needs.

"The department of state is carrying the flag of the twentieth century. It aims to be responsible in its own essential sphere to what it recognizes as the imperative demands of American business. It aims at the co-ordination of the work of all departments bearing upon the same great object of American prosperity. It intends in its contacts with foreign governments to maintain the American tradition of candor and good faith and at this difficult time it is earnestly desirous of aiding in the re-establishment of stable conditions and thus of contributing to the welfare of other peoples upon which our own prosperity must ultimately depend."

Keeping Peace on the Pacific

Protest Against a Radio Monopoly

ONE of the most vital requisites to permanent peace and good understanding on the Pacific is a cheap and efficient news-service, either by cable or radio. Pending the establishment of adequate commercial radio facilities, it devolves upon the American and Japanese governments to permit the use of their naval and other official radio stations for the transmission of news matter at the lowest possible rates consistent with good service. This is, perhaps, one of the most important questions before the newspapermen of both countries to-day, for unless some such practical solution is found, American newspapers will have to depend to a large extent on British sources for news from the Far East. Americans should have their news of the day from this part of the world presented to them without coloring or editing from the many special pleaders and propagandists who in most cases monopolize the sending of Far Eastern news. Peace with understanding is dependent upon the outcome. If the results of the Washington conference are to be permanent; if the Pacific Ocean is to remain true to its name, the next ten years must witness a complete *rapprochement* between Japan and America, with a more intimate knowledge of Chinese and other Far Eastern problems. Not only is this essential for promoting peace and good-will, but for the proper development of trade.

That energetic organ of American newspaperdom, *The Editor and Publisher*, has been conducting a strenuous fight for the passage of a bill that will extend for five years the use of the American naval radio facilities in the Pacific for news dispatches. The opposition forces are taking the stand that the government is being placed in the position of competing with private industry, but in refutation of this, it has been pointed out that unless the naval radio is used the service will have to be discontinued, so in view of this fact there could be no competition.

Underwood and Underwood

OWEN D. YOUNG

Vice-president of the General Electric Company, who, at the instigation of Admiral Bullard, conducted the negotiations which put American commercial radio entirely in American hands.—*World's Work*

Another argument of the opposition is that set forth by the Radio Corporation of America, which contends that a five-year extension will seriously interfere with its marketing of securities to raise funds with which it says it plans to extend its facilities. Representatives of the corporation told the senate naval affairs committee that they were not opposed to a two-year extension, but they claimed if congress authorized a longer period, it would interfere with their plans. They could give no assurance that they would be prepared to handle the press business in two years, but said that if they were not, they would not oppose a further two-year extension. They could not, however, give any assurance as to the rates that would be charged. And in this connection, attention has been directed to the fact that the Radio Corporation of America would have a monopoly on the business and could charge whatever it desired.

The campaign of the American editors has been indorsed in a petition signed by the leading newspapers and news agencies of Japan for presentation to the Minister of Communications, requesting that the Japanese navy radio be utilized to permit news transmission at a low rate per word. Attention is called in the document to the rate of a few cents charged between New York and European cities, and that rate contrasted with press rates of 27 cents for wireless and 32 cents for cable dispatches in effect between San Francisco and Tokyo. "If the present situation is not improved," the petition declares, "the result will be harmful to the interests both of Japan and America."

There is every reason to believe that the project aimed at lower trans-Pacific press rates will be successful. The Japanese government is known to be willing to grant the use of its naval radio facilities. An agreement which exists between the ministry of communications and the Radio Corporation of America ostensibly would prevent the use of government stations for this purpose but, in view of the fact that the service given the newspapers would be temporary and intended only to bridge over the period until increased facilities permit the private companies to handle news dispatches at a reasonable rate, the Radio Corporation is expected to give its consent. This company's business in Japan is conducted through the imperial government telegraph bureau and the ministry of communications, and statements already issued by officials in these departments indicate that the Radio Corporation's agreement will not be an obstacle to the proposed co-operative arrangement.

In view of the importance of this measure for the advancement of international friendship, it would seem that some compromise might be effected along lines that would not unduly interfere with the success of the Radio Corporation in marketing its securities. On the other hand, there is every good reason why editors and publishers should oppose any plan that might ultimately lead to the practical monopoly of any company in the transmission of Pacific news. What the nations of the Pacific need, and need quickly, is cheap communication, to break down prejudices and racial ill feeling. We have ten years to work in before the expiration of the

period of naval limitation. If the Radio Corporation of America cannot give the assurance needed at this time as to when it will be able to take over commercial business at reasonable rates, then it would seem that the higher interests of the nations and peoples concerned demand that the extension of the use of the American naval radio for cheap newspaper messages be granted by congress. The cause of peace and good understanding should not be made subserviant to the requirements of private capital, no matter how worthy and patriotic their motives. In this one matter of cheap press dispatches, it is clearly up to the governments of the United States and Japan to leave no stone unturned, to stop at no cost, in order to complete the first great step towards mutual understanding resulting from the Washington conference.

* * *

No comment on the radio situation in the Pacific would be complete or just without some reference to the great work already accomplished by the Radio Corporation of America for the advancement of nation interests. In this, the credit goes largely to an admiral in the navy and his assistant in charge of naval communications. We cannot do better than reprint the editorial from *World's Work* which reveals for the first time something of the activities of these two naval officers which broke the European radio monopoly and permitted an American company to enter the field.

Rear-Admiral William H. G. Bullard of the United States navy and his assistant, Commander S. C. Hooper, performed a very valuable service to the United States of which people have heard little. As a people we are accustomed to expecting much from the army and navy without special reward, and curiously enough the traditions of those services are such that we commonly get what we expect.

Admiral Bullard's case is a very good example. It was owing to this officer's energy and foresight in doing more than his duty that the United States now has, in American hands, the most effective radio communication of any nation.

Underwood and Underwood

REAR-ADMIRAL WILLIAM H. G. BULLARD

Whose visit to the offices of the General Electric Company on April 5, 1919, began the sequence of events which ended in American control of commercial radio in this country and in the dominance of the American interest in the South American field.—*World's Work*

With the exception of Marconi, almost all the great names in radio, Fessenden, de Forest, Squier, Pupin, Armstrong, etc., are Americans, yet by 1919 British commercial enterprise and finance had secured a dominant position in radio communication all over the world. As British enterprise had done the same with cable communication, an American invention, the United States was largely dependent upon British companies for its communication with the rest of the world. As late as the beginning of 1919 the Marconi companies were dominant in the radio field all over the world. There were several Marconi companies including an American one, but the British Marconi Company controlled them all. In building up their business the Marconi companies were negotiating with the General Electric Company for some high-speed alternating current machines for sending, designed by Mr. Alexanderson, one of the engineers of that company. The negotiations had been interrupted by the war. During the war the General Electric Company, being unable to find a market for these machines. had set up two of them at its own expense as a demonstration at the New Brunswick station of the American Marconi Company.

This station had proved particularly effective when taken over and operated by the navy, Admiral Bullard being then chief of communications. The war being over early in 1919 the negotiations were again in progress with the Marconi Company, and all but settled when Admiral Bullard got back from Paris.

On April 4, 1919, Mr. Owen Young, vice-president of the General Electric Company, got a telegram from Admiral Bullard asking him not to sign the agreement with the Marconi Company until the admiral had a chance to see him. The next day the admiral and Commander Hooper reached New York. The admiral urged the General Electric Company as a patriotic American concern not to sell its apparatus to foreign companies and thereby impair the possibility of forming a strong enough American company to meet foreign competition.

An American Company

It was pointed out to him that the General Electric Company had spent a great deal of money on this apparatus, that it was a manufacturing company, not a radio company, that it could sell to the Associated Marconi Companies and that there was practically no other customer. But that did not discourage the admiral. He persuaded the General Electric Company to have the courage of his convictions and to try to form an American radio company and sell its apparatus there. He promised to try to get for such a company, government support; and he did try and nearly succeeded.

However, by this time the General Electric Company had gotten a firm hold on the admiral's convictions and proceeded regardless of the failure to get government support. The first essential was to get control of the American Marconi Company. Mr. Young went to England and persuaded the British company to sell its interests and to make satisfactory traffic arrangements with the new American concern. Likewise the French Marconi Company agreed to sell the Tuckerton, L. I., station to the Radio of America, as the new company was called. By these negotiations the Radio Corporation came into possession of all the high powered sending stations in the United States except the government stations, and had, moreover, favorable traffic arrangements with the companies in Europe.

Then the problem was to develop the facilities both commercially and technically as rapidly as possible. To this end Mr. Young sought the aid of the American Telephone and Telegraph

Company which, beside its great experience in selling communication, had also done a great amount of investigating in the radio field. An arrangement was made whereby the Telegraph Company and its manufacturing subsidiary, the Western Electric, made all their patents and investigations available to the General Electric Company and for use by the Radio Corporation ; and in return the General Electric made all its patents and devices available for the Western Electric and the Telephone Company, it being agreed that the Radio Corporation should not use these licences in the telephone field and the Telephone Company should not use the licences it received in the commercial field except where it supplemented the telephone system.

Backing of Strong Firms

So at the instigation of an admiral in the navy an American radio company came into being, and under the management of Mr. Young it acquired the backing not only of the General Electric Company but of the Telephone Company as well, and later the Westinghouse Company made its patents and devices available for the Radio Corporation also.

On April 4, 1919, the Radio Corporation existed only in the brain of Admiral Bullard. On December 1, 1919, it was ready for business. On March 1, 1920, it received the stations from the hands of the government. It is now the largest and best equipped commercial radio company in the world, is American run and American owned, and provides the United States with American-controlled communication with the rest of the world. There are now five circuits—to Great Britain, to Norway, to Germany, to France and across the Pacific.

Radio Development in Japan

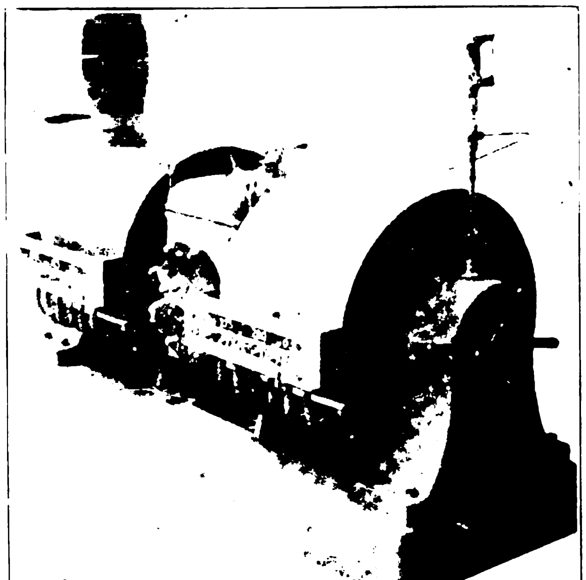
H. C. Huggins

IN 1897 Japan first learned of the successful results of Marconi's experiments with wireless communication, and stimulated by this, the department of communications at once began an experimental study of radio, quite independent of the Marconi inventions. Details of the Marconi experiments were kept a profound secret, and under the circumstances the department found it extremely difficult to manufacture the necessary apparatus. By the summer of 1897, however, the department of communications had succeeded to such an extent that experimental communication between Tsukishima and Shinagawa, a suburb of Tokyo, were successfully carried on.

Ever since 1897 the Japanese government departments have been engaged in profound researches into wireless problems, and great progress has been made, despite the fact that all use of radio has been jealously monopolized by the government, and independent investigation has not been permitted until recently.

In 1900, communication between Tsudanuma and Yahata, some 10 nautical miles was opened, and at the same time two stations at Yawata, Kazusa province, and Otsu, Sagami province, 29 miles apart, were successfully operated. Thereafter from Funabashi, Shimosa province, to Otsu, Sagami province, 34 nautical miles, communication was effected and regularly maintained.

The technique of the department's system improved every year, and is now known in Japan as the "Teishinsho" (the system of the department of communications). In 1903, in fact, wireless communication, using the "Teishinsho" system, was opened between Nagasaki and Formosa, 630 nautical miles, proving that the Japanese system is as practical as any of the others now in use throughout the world.



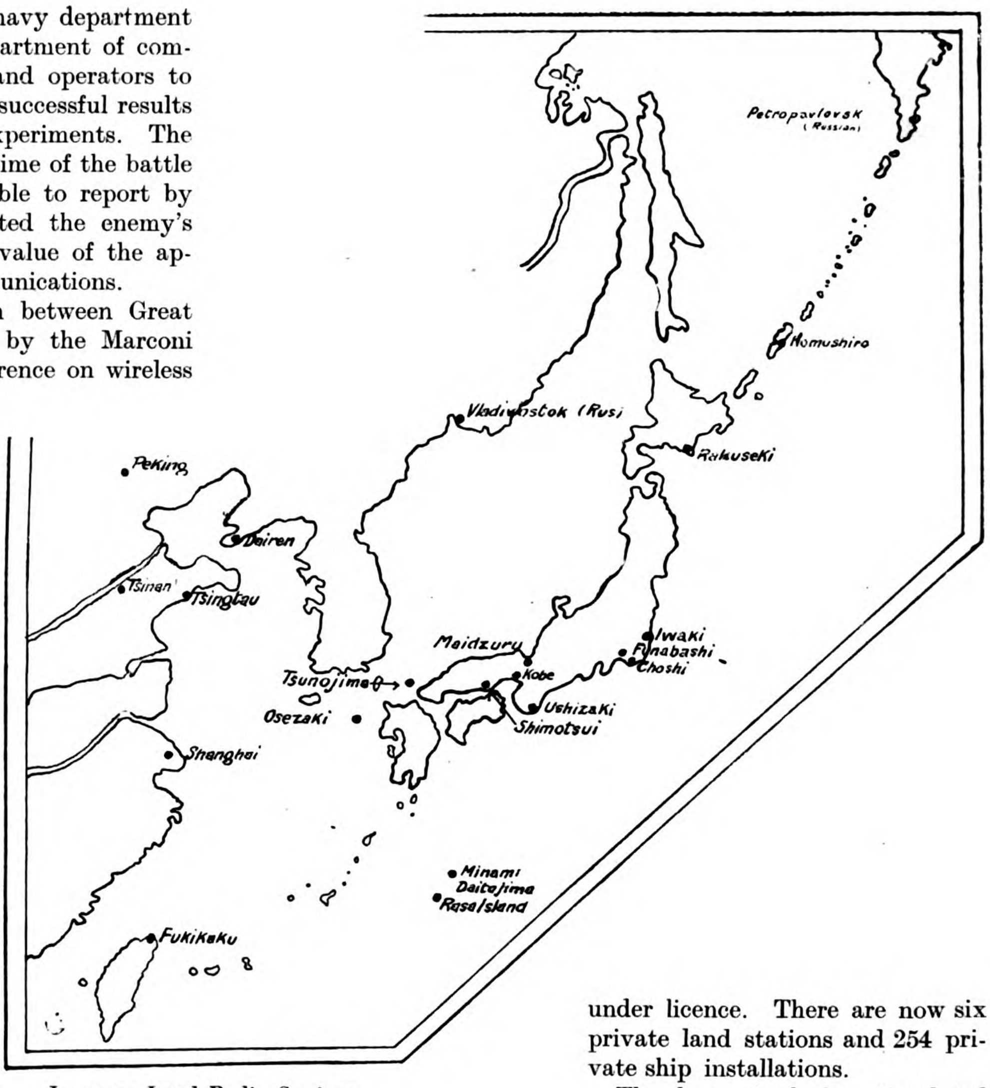
Arc Generator made by the Nippon Radio Company

Some of the inventions which have made the "Teishinsho" system a success are listed in the following table :—

Name of Invention	Year Granted	Inventor
Radio wave detector	Dec. 16, 1904	Osuke Asano
Radio wave detector	March 19, 1907	Mitsuru Sayeki
Radio sending system	Oct. 7, 1907	,, ,,
Tantalum detector	Oct. 21, 1908	Yuichi Torigata
Receiver mineral detector	Dec. 8, 1908	,, ,,
Sharp cone mineral detector	May 18, 1909	,, ,, and Eitaro Yokoyama
Radio telegraph and telephone receiver	June 3, 1909	Mitsuru Sayeki
Extra high-tension dry condenser	July 22, 1909	,, ,,
Radio detector for telegraph and telephone	July 22, 1909	,, ,,
Wave detector for wireless telegraphy	Sept. 8, 1910	,, ,,
Radio sending and receiving apparatus	Aug. 22, 1910	Yuichi Torigata
Enamel covered condenser	Nov. 24, 1911	,, ,,
Quenched spark gap for wireless telegraph and telephone	Feb. 10, 1913	Mitsuru Sayeki and Kumanosuke Koyama
Sound proof arrangement for spark discharge	Dec. 12, 1913	Mitsuru Sayeki and Yoshio Yoshida
Simultaneous sending and receiving apparatus for radio telephone and telegraph	Dec. 17, 1913	Eitaro Yokoyama
Current intensifying arrangement for spark discharge	Sept. 13, 1918	Mitsuru Sayeki, Yoshio Yoshida and Kumanosuke Koyama
Multiplex telephone and telegraph wire for radio	March 8, 1920	Yuichi Torigata, Masujiro Kitamura, Noboru Maruke, Teijiro Horie and Eigoro Tsunobu
High frequency telephone and telegraph apparatus	April 14, 1920	Same inventors as above
Wave sending apparatus for radio telegraphy	March 2, 1920	Masujiro Kitamura

During these early years of experiment the navy department realizing the value of wireless, requested the department of communications to lend some of its experimenters and operators to the navy, so that it might take advantage of the successful results of any of the department of communications' experiments. The fact that the sentinal ship *Shinama Maru*, at the time of the battle of Tsushima, in the Russo-Japanese war, was able to report by wireless to Admiral Togo, "We have just sighted the enemy's ships," is one of the historical instances of the value of the application of researches of the department of communications.

In 1903, successful wireless communication between Great Britain and the United States was established by the Marconi system. This led to the first international conference on wireless in Berlin. Japan sent delegates both from the department of communications and the navy department, and subscribed to the articles of the treaty negotiated there. Japan also became a party to the treaty negotiated at London in 1912.



Japanese Land Radio Stations

The first wireless stations for the transmission of public messages in Japan, were opened in 1908, at Choshi, Tsunojima, and Ohsesaki; and seven steamers flying the Japanese flag, including the *Tenyo Maru* of the Toyo Kisen Kaisha, and the *Tango Maru*, of the Nippon Yusen Kaisha, installed wireless apparatus that year. Some years later, the station at Choshi, and the new station at Funabashi were regularly broadcasting meteorological observations and time reports.

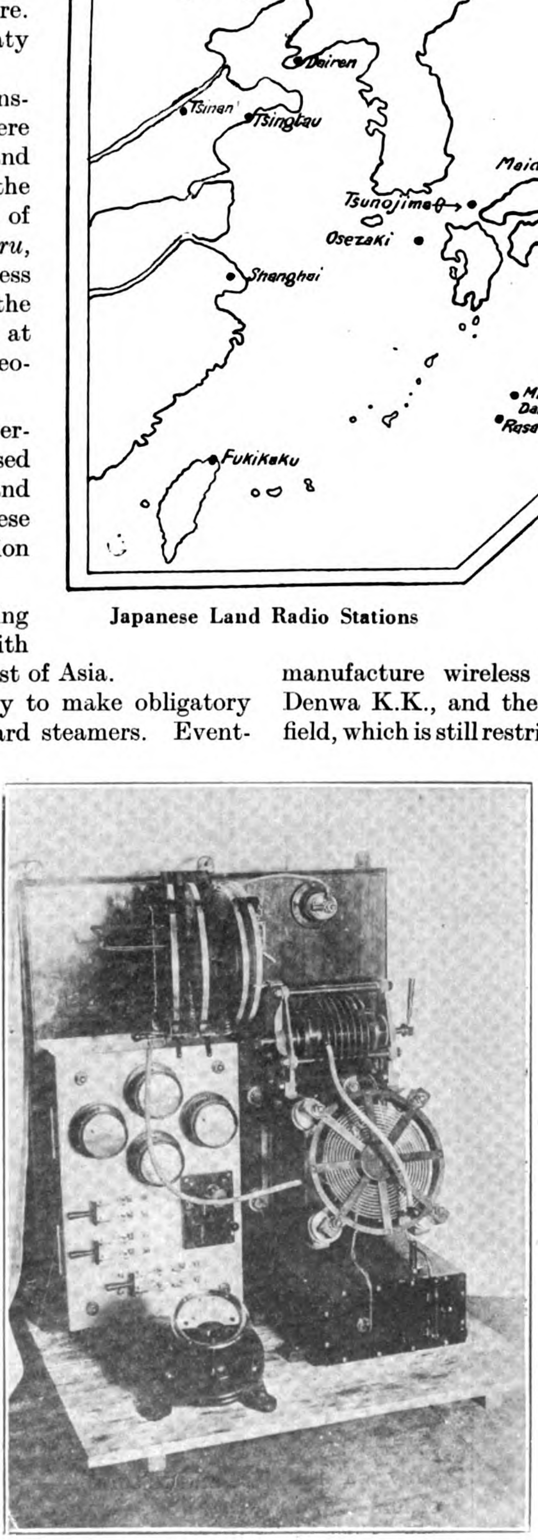
Since 1908, the number of Japanese merchant vessels carrying wireless has increased to 394, while there are 15 non-military land offices under the jurisdiction of the Japanese government. Among these, the Iwaki station is one of the finest in the world.

The Japanese stations now operating keep Japan in direct communication with the United States and Canada, and the coast of Asia.

The United States was the first country to make obligatory the installation of wireless equipment on board steamers. Eventually an international agreement to instal wireless on all passenger ships was reached. Japan, however, was prevented from placing this law in complete operation because of the shortage of apparatus caused by the European war. But during the past few years Japanese companies have taken up the manufacture of wireless apparatus, and the shortage is being made good by home-made equipment. Consequently the time is not far distant when all Japanese ships will be equipped with wireless.

Naturally, Japan lacks competent operators. In order to remedy this, the department of communications has laid down rules for the examination of candidates for licences which permit private schools to train students as radio operators on Japanese vessels.

Up to 1915, the conduct of wireless was regulated by the provisions of the telegraph law. This law was too restrictive in its application to private activities, so in 1915 it was changed, and for the first time, private owners were permitted to establish wireless stations, under licence. There are now six private land stations and 254 private ship installations.



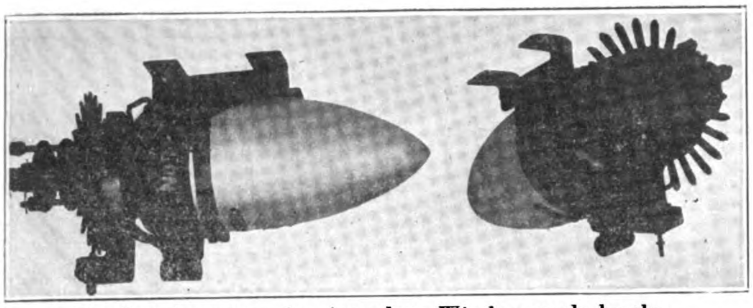
Wireless Set for Trawlers made by the Nippon Electric Company

The change in the law stimulated the organization of companies to manufacture wireless apparatus. The Nippon Musen Denshin Denwa K.K., and the Annaka Denki K.K., were pioneers in this field, which is still restricted to less than ten companies of importance.

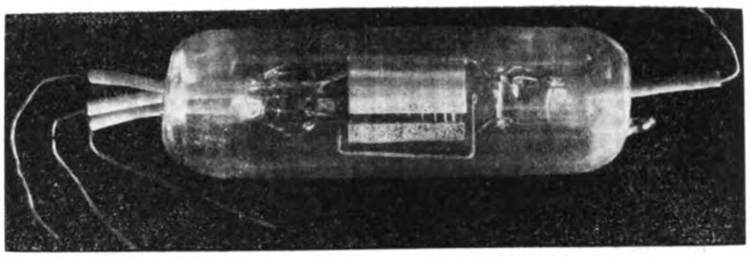
In 1912, during an interruption of the cable service between Japan and Taiwan, wireless service was first established from the main island of Japan and Formosa (Nagasaki is in Kyushu, which is not the main island of Japan). In June 1915, an office was opened on Rasa Island, connecting Japan and Rasa. Japan's first international wireless communication was begun in 1915 when an office at Ochiishi, Hokkaido was placed in communication with another at Petropavlosk, in Kamchatka.

In 1916, the Funabashi station opened communication with Hawaii, and this proved a great assistance in establishing communications between the United States and Japan. With the completion of the Tomioka receiving station at the Iwaki office, in May, 1920, a double line of communication with the United States was opened. Its area of communication includes Hawaii, the Pacific coast of the United States and Canada, and connection can even be made with New York.

Following the example of the rest of the world, Japan's engineers have



Sending Apparatus for Aeroplane Wireless made by the Nippon Radio Company



Vacuum Tube made by Nippon Radio Company

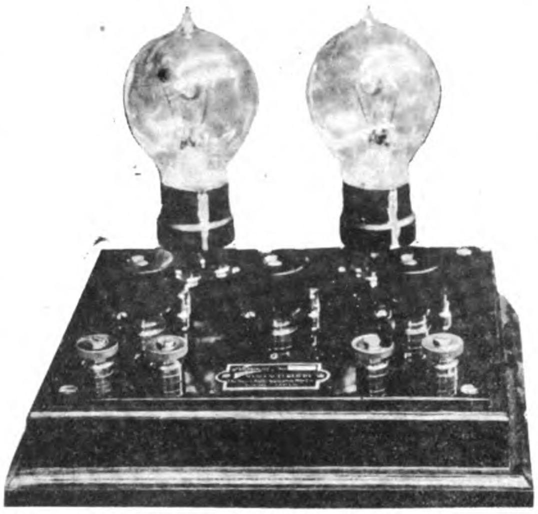
been busily engaged in wireless experiments, in an endeavor to perfect a system for long-distance communication. The Haranomachi station which will soon be completed will embody the latest of the improvements made by the Japanese engineers.

The navy department is carrying on research work at the Tsukiji naval arsenal, in Tokyo. In the early days of navy experiment the ordinary spark system was used. Just before the European war the quenched spark system was adopted, but now the undamped system, the arc system and the generator system are also the object of navy research. The navy operates the Funabashi station, and has almost completed another station in Taiwan, which is as large as the Funabashi station.

The chief experimenters in the navy department are Dr. Tsutomu Minohara, Mr. Tatsuo Matsuda, Mr. Kazue Hattori, Mr. Katsuuki Nishizaki and Mr. Genyo Osawa.

The Army

Up to the time of the European war the Japanese army had done nothing to speak of in developing wireless communication for military purposes. But during the war a section of that department was devoted to wireless experimentation and a laboratory established at Nakano in Tokyo prefecture. To-day the army department owns the Nakano, Moji, Kanazawa and Otaru stations, and there are other military wireless stations belonging to the army department in China and in Siberia.



Vacuum Tube made by Nippon Radio Company

The army is actively purchasing portable wireless apparatus for army use from foreign countries. It is also developing its own system, because the authorities are unwilling to depend on foreign countries for equipment which might be essential in time of war.

The army department also maintains an aerial communication section, occupied primarily with aeroplane study. But under the direction of French officers, teachers in the aviation school, wireless apparatus has been installed on all aeroplanes under their direction. The apparatus is French, but some parts are of Japanese manufacture. Recently some British officers have been engaged as trainers of the aviation corps and introduced British-made machinery. Great expectations are entertained of the development of the aerial bureau, and with the growth of its operations the use of wireless equipment will expend.

Department of Communications

With the exception of the stations under the direction of the army and navy, Japan's wireless systems are under the control of two bureaux in the department of communications: the bureau of wireless installations and inspection under the direction of Mitsuru Sahegi, and the bureau of wireless research directed by Uichi Torigata.

The bureau of installations and inspection has under its control the great Haranomachi wireless station which has just recently been built with the object of exchanging direct messages with America. This station is a steel concrete tower 600-ft. high, and will be equipped with its 400-kilowatt high frequency, Alexanderson generator. Pending the installation of this generator the station communicates with Hawaii by the arc system.

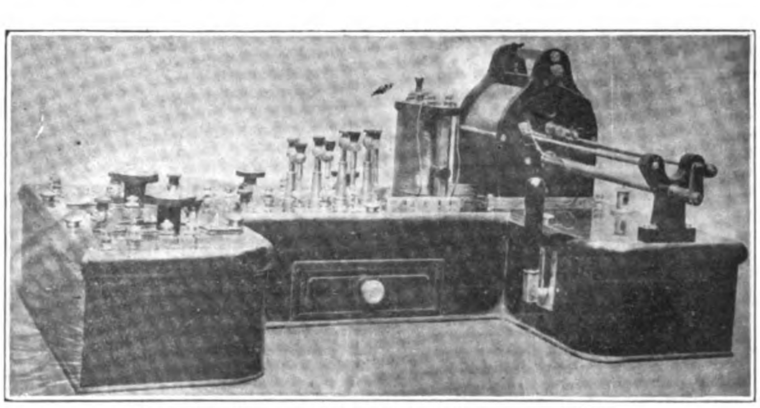
This bureau is also directing the construction of the Peking wireless station, contracted for by the Chinese government with the Mitsui Bussan Kaisha.

The bureau of research has been confining its work to experiments on commercial apparatus. The 'T.Y.K.' wireless telephone apparatus, connecting wireless with ordinary telegraph service, and apparatus which will both send and receive at the same time, have been perfected by this bureau. At present its researches are confined to perfecting wireless telephones.

Only the Haranomachi and the Funabashi stations have been built to handle trans-oceanic communication. Most of the other stations were built to communicate with steamers only.

The policy of the Japanese government is to place all steamship wireless plants under the control of government operators. There are now about 310 installations on Japanese steamships, of which, 50 have government operators. With the extension of wireless the demand for equipment is rising, and Japanese companies are slowly monopolizing the business, their equipment being cheaper and almost as satisfactory as that imported from other countries.

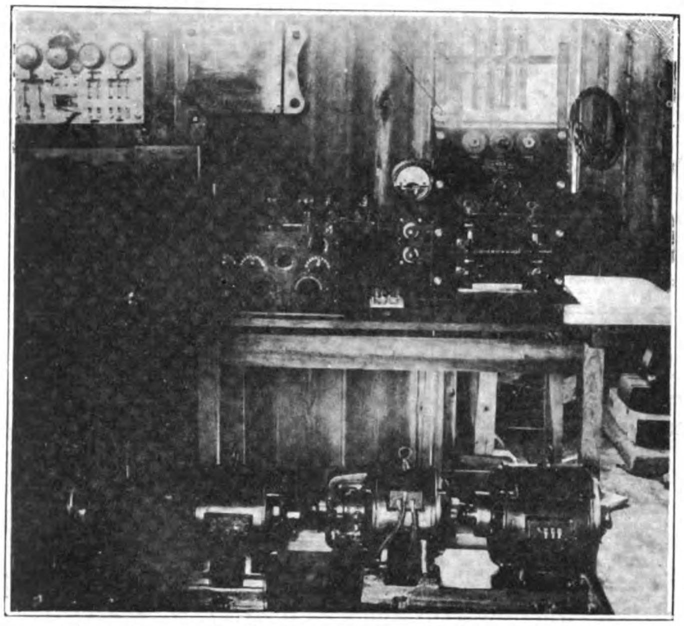
The Nihon Musen Denshin Denwa K.K., is the only company in Japan, which exclusively manufactures wireless apparatus. This company has built several land stations for the different government departments and also manufactures all classes of apparatus used on board ship, such as the car system, vacuum system, wireless telephones and accessories.



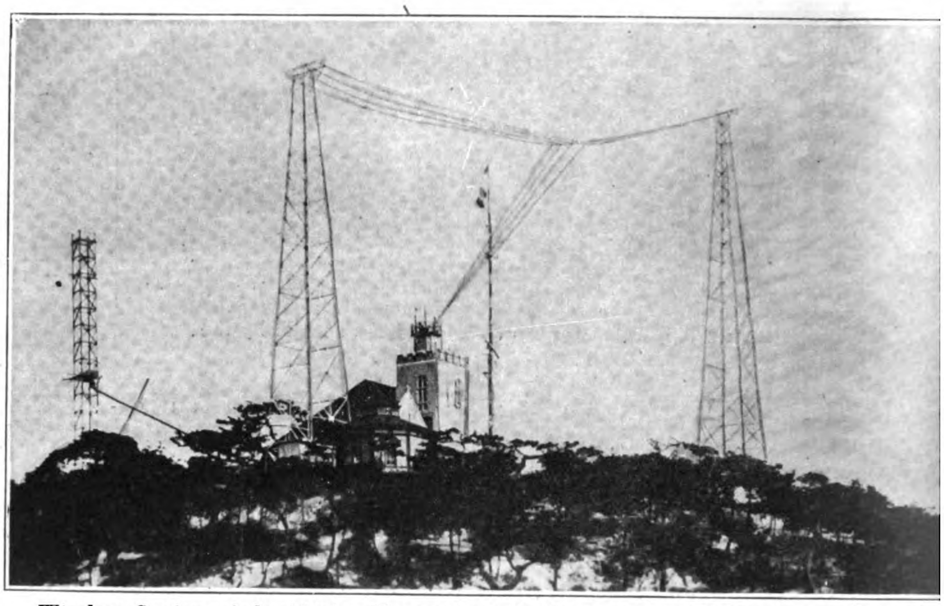
Receiving Set made by Oki & Company, Tokyo

It now erecting and equipping with its own apparatus the Ocean Meteorological Observatory station at Kobe. Two systems will be installed, the arc and the spark. When completed, ships will be furnished with meteorological reports. For the first time in Japan, steel towers of the self-supporting type for the aerial lines are being used.

Trawlers, which are so important to the food supply of Japan



Complete Radio Outfit made by the Imperial Radio Company (Teikoku Musen Denshin K. Kaisha)

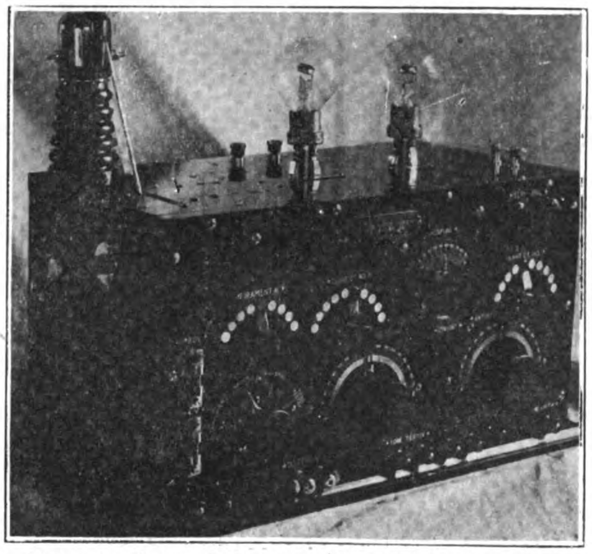


Wireless Station of the Marine Meteorological Observatory, at Kobe, Japan, Erected and Equipped by the Nippon Musen Denshin Denwa Kabushiki Kaisha

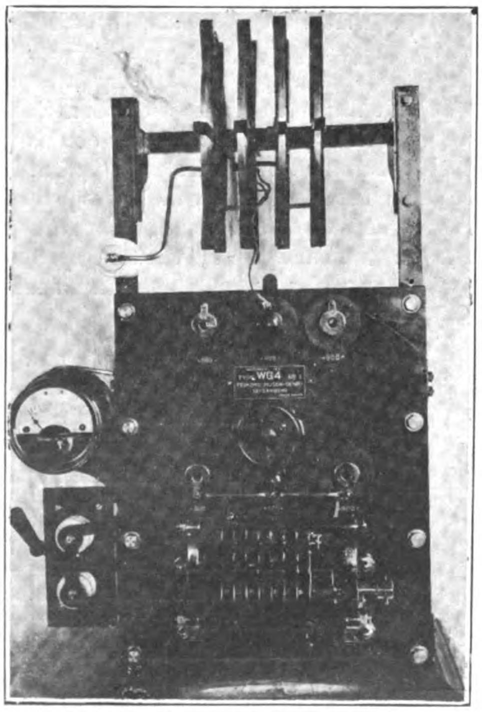
were most irregular in their returns to port, and the market price of fish could never be regulated. The Kyodo Gyogyo K.K., one of the largest fishing companies in Japan, equipped its vessels with wireless apparatus built by the Nihon Musen Benshin Denwa K.K., and as a result has greatly increased its profits by controlling the movements of its vessels.

The capital of the Nihon Musen Denshin Denwa K.K. is Y.1,000,000, one-quarter paid up. Mr. Jukuro Kadono, the principal member of the Business Men's Commission, which has just completed a trip to the United States and Europe, and a director of Okura Co., is president of the company.

In April, 1920, the Teikoku Musen Denki Seisakujo was organized to engage in the manufacture of wireless apparatus. This concern is a subsidiary of Suzuki & Co., of Kobe. Its manager is Mr. T. Tsujiminato. Its factory has been erected in the town of Kamata, between Yokohama and Tokyo. Its engineering staff is headed by Mr. Hayao Kadooka, an authority in military wireless apparatus. The works are swamped with orders from the army departments.



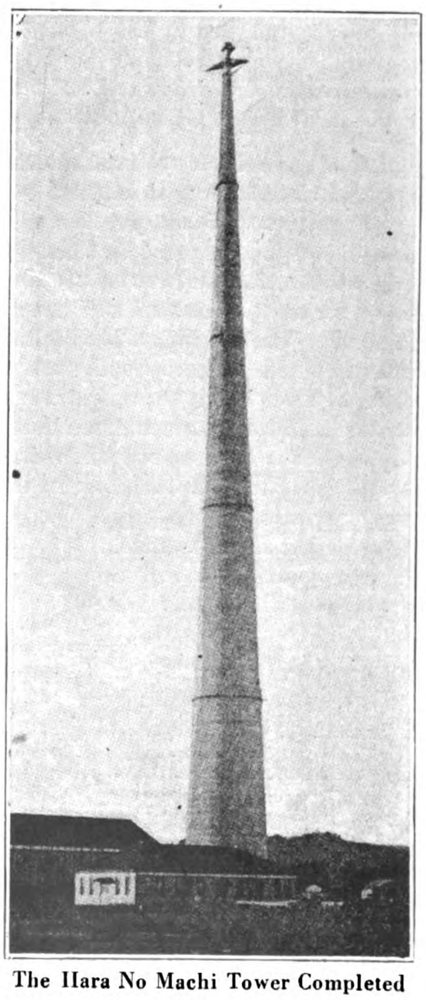
Receiving Set made by the Imperial Radio Company



Sending Apparatus made by the Imperial Radio Company

The Oki Electric Co., Ltd., established in 1881, is the oldest enterprise in Japan engaged in manufacturing telegraph and telephone apparatus. In 1913, it started the manufacture of wireless apparatus and was at once patronized by the governmeut departments. In 1915, when the private wireless act permitted the private use of wireless, this company installed plants in its head and branch offices, using three-kilowatt sets, quenched spark system. In 1918, a vacuum-bulb factory was built by this company, the product equalling in all respects the foreign-made bulbs. In 1919, a workshop to manufacture wireless telegraph and telephone apparatus exclusively for the military departments was constructed on 3,000 *tsubo* of land in the suburbs of Tokyo. The arc convertor which is to be placed in the Ibaraki wireless station is the product of this company. On December 15, 1921, according to the department of communications, there were 811 wireless stations controlled by Japan. Of these 118 were land and the balance 693 were steamship installations.

	On Land	At Sea
Military stations ..	19	10
Naval stations ..	20	243
Government, department of communications ..	15	90
Private stations ..	3	394
Research stations, etc.	17	—



The Hara No Machi Tower Completed

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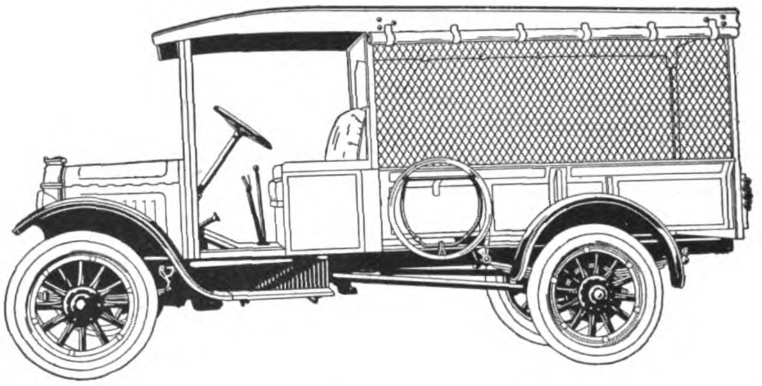

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Taxes, Motors and Roads in Japan

JAPAN is falling into line with the rest of the world in encouraging automotive industries. One of the first steps was to remove the high and discriminatory taxes on motor vehicles which last year were practically prohibitory throughout Japan. In Tokyo, the authorities raised the motor tax by 50 to 80 per cent. The operating costs became excessive and many cars were retired from service. At the time there were 5,000 cars in circulation. Upon promulgation of the law 600 licenses were returned and a like number of cars placed in storage. A major problem of Japan—that of congestion in cities—was made more difficult of solution because of the decrease in modern transportation.

Baron Goto, Tokyo's Mayor, who has put through a Yen 40,000,000 Street Improvement Program

The Japanese government, realizing this error, recently sent an official to the United States to study traffic arrangements. His conclusion was that Japan can solve its problem of congested cities best by encouraging motor vehicle transportation. The removal of discriminatory high taxes is the first step, and the recent action of the Tokyo authorities in that direction may soon be followed by the other prefectures throughout Japan.

In the new Tokyo schedule the biggest reductions have been made in the 20 horsepower class, which includes practically every six cylinder automobile operating in Tokyo. In 1921, the taxes for cars of this class amounted to Y.963.00. The new schedule reduces this by 18 per cent., and the tax now stands at Y. 787.05.

The tax for cars of from 15 to 20 horsepower has been reduced by 10 per cent., in the 10 to 15 horsepower class., 6 per cent., with practically no reduction in the 5 to 10 horsepower class, embracing the majority of the light cars.

The reductions in the 20 horsepower class and over will benefit both motorists and dealers and increase the sales of six cylinder cars which sell at from Y.5,000 to Y.7,000.

The following tables show the new taxes which went into effect last month:—

Private Automobiles and Trucks

	Total Yearly Tax
Over 20 horsepower	Y.787.95
From 15 to 20 horsepower	614.00
From 10 to 15 horsepower	404.79
From 5 to 10 horsepower	244.90
Less than 5 horsepower	139.04

Public Automobiles and Trucks

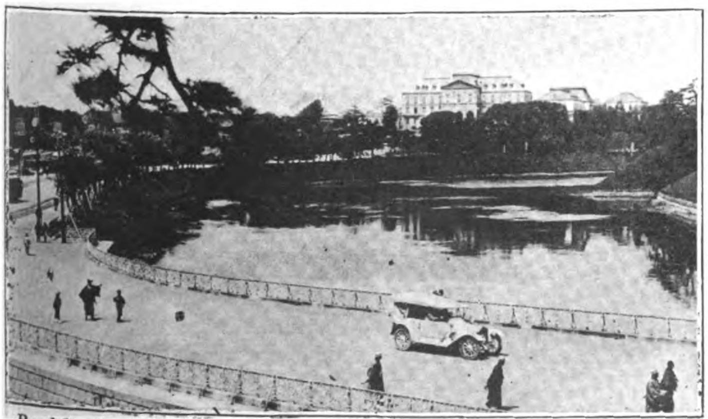
	Total Yearly Tax
Over 20 horsepower	Y.370.80
From 15 to 20 horsepower	264.02
From 10 to 15 horsepower	185.40
From 5 to 10 horsepower	124.00
Less than 5 horsepower	75.84

Notwithstanding these substantial reductions over the taxes levied the preceding year, they are still out of all proportion to these prevailing in other countries and militate against purchases of new cars. Conditions, however, point to a still further reduction that will again make the possession of a motor car desirable and stimulate not only importations but the manufacture of cars in Japan.

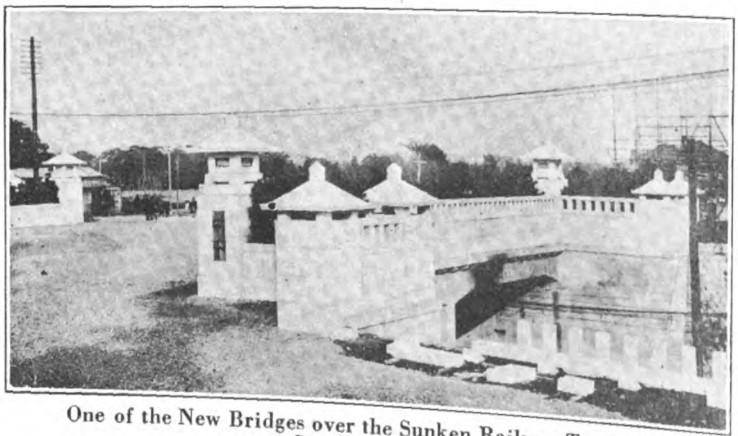
Considerable progress in building and assembling is being made in Japan, and a visit to the Tokyo Peace Exhibition will demonstrate the remarkable advances already made in design and construction by purely Japanese manufacturers. Although some of these cars are merely models and have not as yet been placed on the market, they are evidence of the fact that the Japanese are preparing against the day when a national road system will create a market for home automobiles that the government will be called upon to protect on the usual manner.

Foremost amongst the Japanese exhibitors is the Mitsubishi Company which shows a limousine of their manufacture, modeled on the general lines of the 15 horsepower Fiat model..

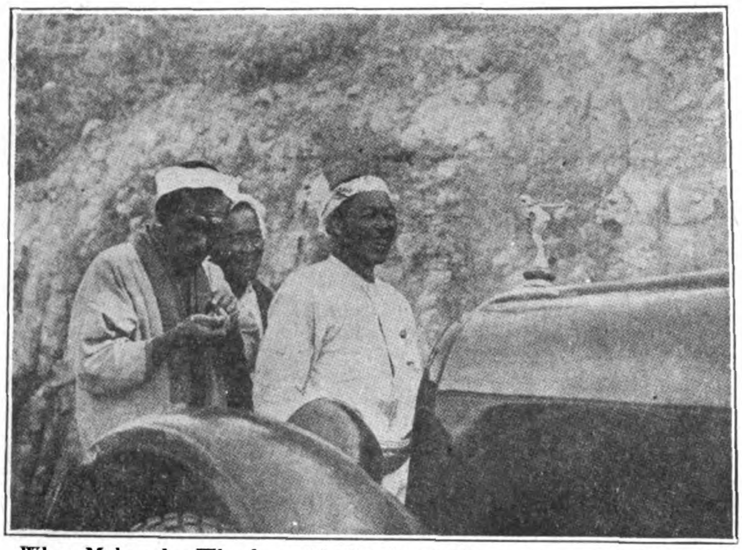
Another interesting Japanese exhibit is the Gorham three wheel light car, manufactured in Osaka. The touring model



Road leading to the Sukurada Gate of the Imperial Palace at Tokyo



One of the New Bridges over the Sunken Railway Tracks in Japan's Capital



What Makes the Wheels—with Goodyear Tires, notice—Go Round? These Japanese coolies, seeing an automobile for th first time, think the "goddess" on the radiator cap is responsible, the man who took the picture says. Anyway, they're enjoying themselves

seats three, one in front and two behind. It is sold at a low price, about the same as that asked for a large two-cylinder motorcycle.

The Hakuyosha Company exhibits the models of two small four-cylinder cars, which will be placed on the market in a few months.

The German S-B electric, a one-passenger car, which is quite popular in Tokyo is also exhibited as a Japanese machine as it is to be made in Japan.

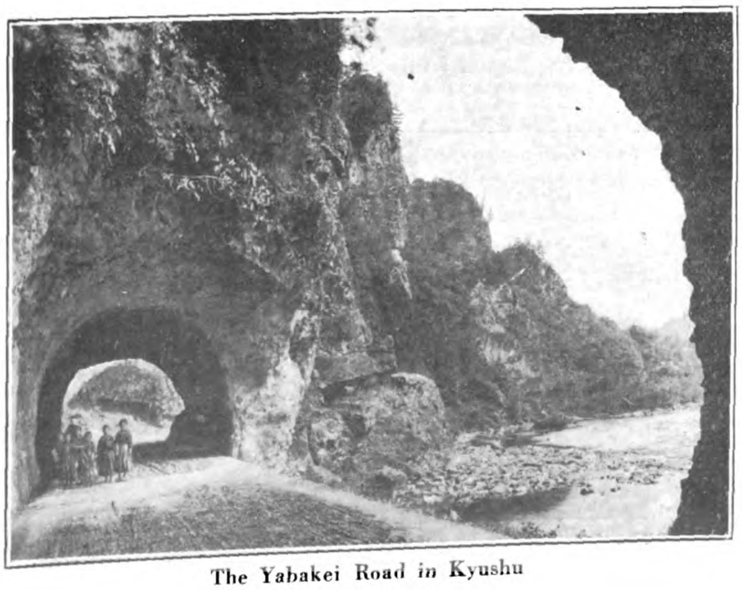
Nosawa & Company exhibit a large Telco limousine electric car, which will also be placed on the market in the near future.

The Tokyo Ishikawajima Company exhibits its Wolsely car which is assembled, mostly from English parts, at its Tokyo plant, under the supervision of English engineers.

If these huge investments in automobile plants in Japan are to bring profitable returns, taxes must be lowered to a point that will not discourage prospective purchasers and roads must be built to facilitate traffic. Tokyo and Osaka are leading the way in street improvements.

Tokio Road Program

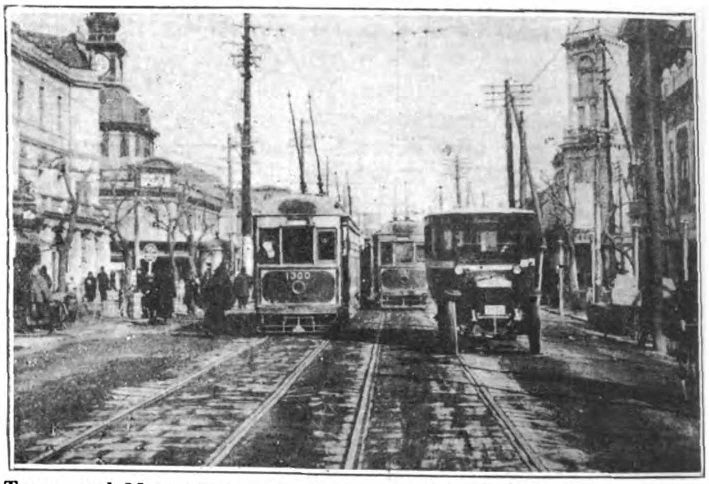
Before fixing upon a definite program, the municipal authorities of Tokyo have been making careful studies of road materials and from 1910 until 1920, 72 paving experiments were carried out enabling the city to determine just what kind of pavement is best suited for Tokyo.



The Yabakei Road in Kyushu

As a result of these experiments a huge program extending over a period of four years has been drawn up and approved by the Municipal authorities.

This provides Y.39,468,000 for new pavements to be completed by 1926 and approximate 275 miles of modern roadway. The streets which are to be paved will be the main thoroughfares, the Ginza being a good example of this work. Stone, wood-blocks and asphalt are to be the principal types new street work. The funds are now available and the home office has signified its willingness to grant five-twelfths of the desired money.



Trams and Motor Buses on the Ginza, Tokyo's Main Artery of Traffic

Asphalt and Road-Making Machinery

Considerable asphalt has been used as surface dressing for Tokyo's macadam and wood-block pavements, and recently an order for 2,000 tons of Trinidad asphalt was placed with the Barber Asphalt Company of Philadelphia, whose representative is now making a tour of Asia investigating the possibilities for asphalt pavements.

As a result of the activity in road building not only in Tokyo but in Osaka and other parts of Japan, considerable business has been done in road-making machinery and dump carts, with the prospect of further large orders in the near future. Here at least is one place in the Far East where modern road-making machinery can find a market, as the extent and character of the program and the limited length of time involved in carrying it out, calls for the employment of up-to-date methods.

Osaka Roads

The city of Osaka will also soon begin an extensive road building program which will extend over a period of ten years and more than 40 million yen will be spent if the plans as proposed by the Osaka city planning commission are accepted and passed by the home department of the national government.

Under the plans as put forward by the city authorities ten main highways radiating from Osaka will be thoroughly made over. The new highways will be of macadam. This investigation has been going on for the last several months with Mayor Ikegami taking a leading part. He is chairman of the city commission. The plans also state that the new roads will be from 48 to 72-ft. in width, this depending upon the amount of traffic which will have to be accommodated. This program is primarily intended to improve the roads in the outlying districts of the city.

According to their announcement the city is also planning to enter upon another program of approximately the same size in rebuilding the city streets of Osaka. This is dependent upon whether or not the first program is accepted by the government. It is planned to carry out the second program in conjunction with the building of the proposed new railway station for Osaka, which is to be the largest in Japan.

Autos and Trucks in Japan

In 1920, 95 per cent. of the number and 93 per cent. of the value of motor vehicles imported into Japan were of American manufacture. Imports from the United States in 1921 declined to 77 per cent. of the total number and 66 per cent. of the value. The following table shows the number and value of automobiles imported, by countries of origin, in 1921 :—

Imports of Motor Vehicles into Japan in 1921.

Countries of Origin.	Number.	Value.
United States	832	$2,160,638
England	75	476,480
France	83	353,432
Italy	46	160,645
Germany	22	32,009
Belgium	4	41,042
Kwantung Province	5	16,006
Canada	6	31,112
Total	1,073	3,271,364

The decline in imports from the United States was especially noticeable in the latter part of 1921, while those from France increased appreciably.

An unofficial investigation as of June, 1921, reported 12,440 cars and trucks in Japan, the number of passenger automobiles being estimated at about 12,000. Approximately 2,550 passenger cars are operated in and around Kobe. There are about 450 trucks in the country, 200 of which are located in the vicinity of Kobe.

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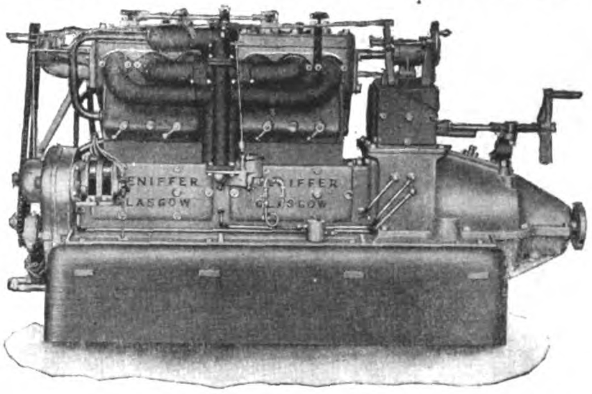

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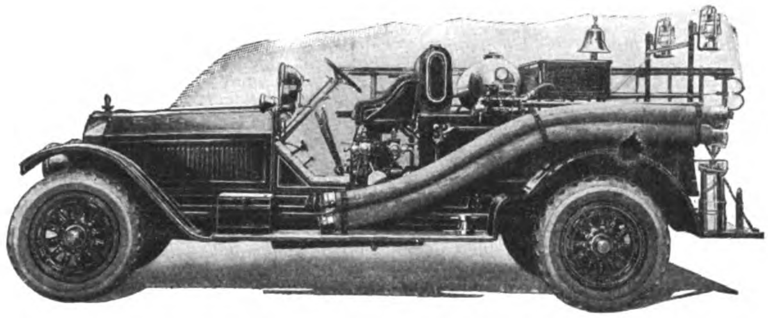

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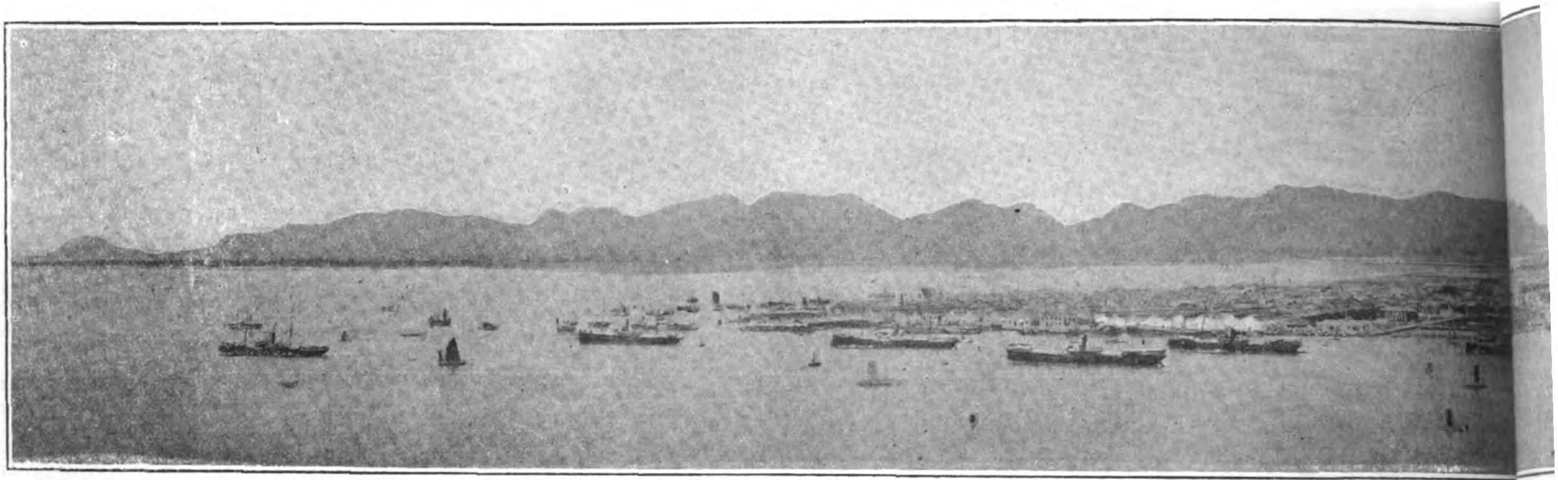


PANORAMIC VIE

Roads and Motors in South China

200 Miles of Macadam Roads to be Built

The Swatow District

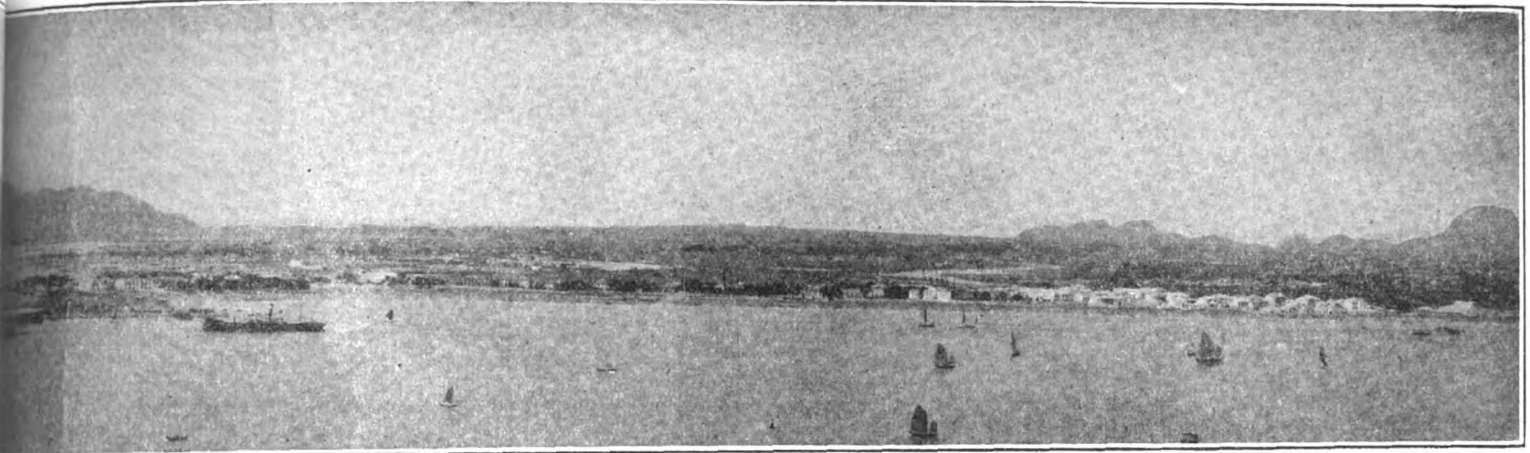
THE often extolled progressiveness of Canton is not confined to that city alone in Kuangtung, and due attention should be given to the highway construction planned and, in fact, begun in the Swatow consular district, which comprises the eastern portion of Kuangtung and includes approximately 17,000 square miles of territory. Up to the present the total length of highway in the district capable of accommodating four-wheeled vehicles has been less than two miles and this stretch is found within the limits of the city of Swatow itself, says a correspondent in *The North-China Daily News*. Now over 200 miles of macadamized highway is projected, some of which has already been surveyed, which will connect the largest cities of the district and also reach many villages. Motor buses, lorries and trolleys will be utilized on the highways, to carry passengers and to transport export cargo, which consists chiefly of sugar, to the port of Swatow.

Harbor Development

Other plans have been made for harbor development to take place at a later date, when the entrance channel will be deepened to accommodate larger draft steamers. The approximate depth at the entrance is now 20 feet at high tide and seven at the lowest. The coast-line along the harbor limits is about two and a half miles in length. All the plans in connection with the development are being worked out by the department of highway engineering, organized at the instigation of progressive officials and business men of the province, whose object is to make Swatow into the great southern port for China.

Included in the comprehensive scheme of highways is one which will link Canton with Swatow. The main road to be built is one which will run from Chaochowfu to Kuetan, via Kityang, a distance of about 72 miles. This highway will connect with another which is being constructed between Kuetam and Waichow, whence a road is already built into Canton. The final link in the chain is the road, soon to be surveyed, between Swatow and Chaochowfu, a distance of about 24 miles. There is already in existence a railway line between the last-named two cities, which is the only railway in the whole of the Swatow consular district. It is considered that highways are more feasible than railways for the development of communication, because they will reach a greater area of country. Among the cities reached under the present scheme of highways are Ungkung ; Yaop'ing, northwestward from Chaochowfu ; Puning, Chaoyang and Huilai, all of these being the largest centres of population in the district and important avenues of trade. The highway from Chaochowfu to Kuetam passes through Haifeng, the birthplace and old home of General Chen Chiung-ming. The walls of this city have been completely torn down and wide streets are being made by order of the general and in spite of the fact that General Chen Chiung-ming's downfall was predicted when his ancestral tablet and the photographs of his parents had to be removed during the process of demolition. A few miles from Haifeng and on the coast is the port of Swaboi, second in importance to Swatow, and in this port, development and improvement is being carried on under the direction of Mr. K. Y. Chen, a graduate of Cornell University and a relative of General Chen Chiung-ming.

New Roads in the Swatow Settlement



SWATOW

The Scheme of Roads

The roads as planned, which are under the direction of Mr. F. H. Kuan, are to be 30 feet in width, graded according to the most improved methods, and surfaced with macadam. All the bridges are to be of reinforced concrete and not less than 30 feet wide.

The country traversed by the road between Chaochowfu and Canton is said to be very beautiful, for the most part level, cut into small fields of rice and other crops, but with small hills at frequent intervals and one range, at least, of mountains, which will have to be crossed or tunnelled. The mountains are rocky and will afford the granite and rock necessary for the construction of the highway. This one road is estimated to cost about one million dollars. The cost of surveying is being paid for out of a tax on joss paper and one or two other luxuries and the returns are said to be more than enough for the purpose. The major portion of the expense of construction will be borne by the cities and villages through which the highway will run. The macadam surface, which is the most expensive portion of the construction, will not be applied by the highway engineering department but by an operating company which, in return for surfacing the highway, will be granted a monopoly to run motorbuses for a period of 20 years over the roads, after which the expense of keeping them up will revert to the government.

The possibilities of this development as planned will be seen to be very great when it is considered that all communication heretofore has been the limited one afforded between cities and villages by boat over rivers and canals and, where these have failed, over three-foot pathways constructed of pounded sand and lime, which are satisfactory for foot traffic. The wheel-barrow, so ubiquitous in northern and western China, is totally unknown in this district, and overland freight and passenger traffic is entirely carried in baskets slung on poles and in sedan chairs respectively, on the shoulders of men and women.

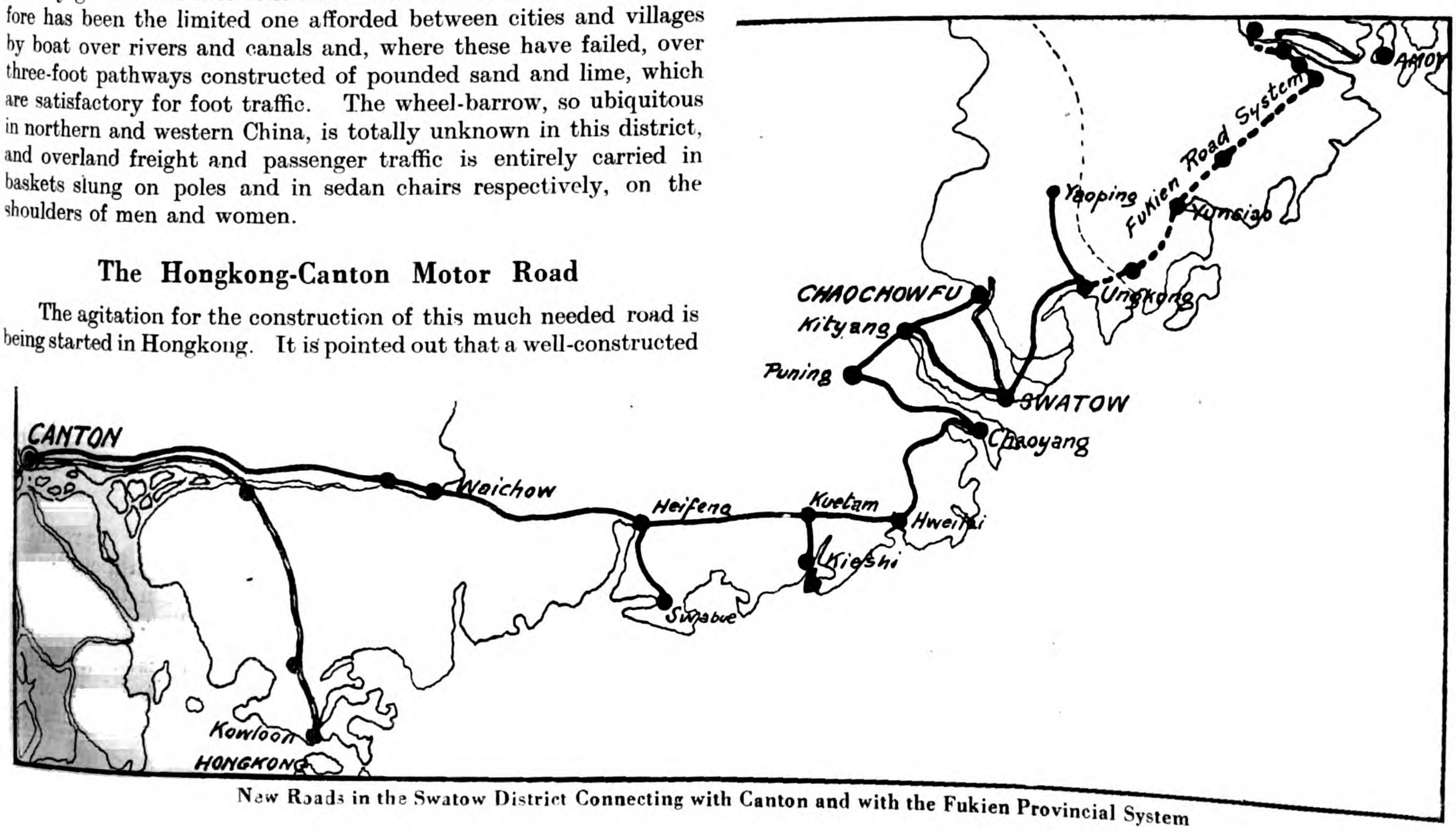
The Hongkong-Canton Motor Road

The agitation for the construction of this much needed road is being started in Hongkong. It is pointed out that a well-constructed motor road connecting Hongkong and Canton would soon become an asset of world-wide importance for all this section. Its fame would spread to every corner of the globe. It would mark these two cities as enterprising and progressive communities. In dollars and cents the income direct and indirect would soon far surpass the outlay.

It is suggested that meetings be called in both cities and a Canton-Hongkong highway association formed with offices in both cities. It is urged that prominent men in both cities be found who will co-operate with a live executive with at least one Chinese and one European to lead in the matter. Difficulties and problems connected with the matter can all be met and disposed of if a group will set themselves unwaveringly to their task.

In a leading article supporting the project, the *Canton Times says*: Besides being a connecting link between the two cities, such a road would also open up a rich, fertile, agricultural section, and by means of motor communication, make it possible for the farmers to bring their produce to Canton where they can obtain better prices than in the market towns in the interior. This would enrich the farmers and give both Hongkong and Canton new sources of food supplies.

Short roads intersecting this motor road could be constructed by the villagers and a motor truck service should bring their produce to the nearest railway station on the Canton-Kowloon Railway. The freight service of that road would soon have to be increased.



New Roads in the Swatow District Connecting with Canton and with the Fukien Provincial System

The facilities offered by this motor road could be utilized whenever the authorities have to deal with robbers in that section of the country. Better communication is one of the factors in the solution of the bandit problem in this province. If the road is well policed and an efficient telephone system installed along its whole length, soldiers could be moved to points wherever their services are needed.

Cars, Cabs and Boats in Hongkong

A few months ago, some Chinese in an outlying fishing village started a service of motor-omnibuses into the city of Victoria. Now the latest advance is the small taxicab. The type is probably well known to readers of this journal; it is a sort of an enclosed sidecar and motor-bicycle outfit.

In a few months 100 British-built taxicabs will be plying for hire in this colony, says the correspondent of the *Times Trade Supplement*. The chair is slow, and the ricsha, with a man puller, is more popular where the roads admit of that vehicle. Where a ricsha can go it is probable that the new taxicabs will go. The really interesting thing to watch will be the practical results. Will petrol prove cheaper than human muscle ? It will certainly be much more popular.

The man pulling a ricsha receives about ten cents, Hongkong currency, a mile. That is, with a normal exchange, just about 2½d. He carries only one passenger. The new taxicabs are supposed to carry two passengers at 15 cents a mile. When the motor-boats now plying for public hire in the harbor first appeared people asked how they could compete with the native rowboats or sampans. They soon proved to be much more popular. Quite a number of motor-boat engines have been imported, not only into Hongkong, but to other places in South China, as a result of the success of those that have plied for hire in the local harbor.

The New Canton

A recent visit to Canton showed that the Chinese municipal authorities there are continuing the plan for the construction of wide roads, or "maloos," as they are called, in that city. Creeks are being filled in. That will make mechanically propelled vehicles possible. There is also a revival of the idea of a bridge across the wide river at Canton. It is said that the municipality has prepared plans and has estimated the cost of such a bridge at about a quarter of a million pounds sterling. The only difficulty is the dearth of money in Canton. However, as the Chinese merchants in Hongkong very promptly guaranteed a fund of about a quarter of a million pounds sterling to ease the recent "general strike" negotiations, it is not improbable that money could be raised in Canton for the proposed bridge if the merchants could be persuaded that the commerce of the city would benefit.

Every new road and bridge that is built in South China is sure to improve trade. The immediate effect will be to revolutionize the methods of transport. The sedan chair and the man-pulled ricsha will pass away from the Far East as surely as the sedan chair has disappeared from London.

Tractors in China

CONSUL-General Heintzleman, Hankow, reports that there has just arrived at Hankow a shipment of agricultural machinery and implements from the United States. The order was placed through a local American concern in connection with the development, by a group of Chinese capitalists of Hankow, of 13,000 acres of land in northern Honan, south of and bordering on the Yellow River.

The promoters of the enterprise intend first to undertake the cultivation of peanuts. The shipment consists of one wheel-type tractor, two disk harrows and two two-furrow gang plows. This is a trial purchase and if the machinery and supplies prove satisfactory additional orders will be placed; moreover, other farming implements and harvesting machines of various kinds will be ordered as required.

Motor Omnibus Laws in Singapore

THE president states that an amendment of the motor omnibus bye-laws is brought forward for the enforcement of regulations for the testing and examination of motor omnibuses, and moves that the following amendment be passed.

After the first day of April, 1922, "no vehicle intended for use as a motor omnibus shall be licensed which has not been inspected, tested and approved by the municipal superintendent of machinery and which does not further comply with the regulations set out in the following schedule :—

Regulations for Motor Omnibuses

Steering Gear.—Must not be more than ¼ turn slack.

Omnibus Bodies.—For one ton chassis and under the overhang must not be more than one-fourth of the wheel base, the overhang to be measured from centre of rear axle to back of body, neglecting steps. For chassis over one ton the overhang at rear must not be more than 5 inches per foot of wheel base, the overhang to be measured as above.

Width.—The body must not extend more than 6 inches outside the other rims of rear wheels.

Height.—The over-all height of body from ground level must not be more than 8-ft. 9-in. for one ton chassis or under and not more than 9-ft. 3-in. for chassis over one ton. The height from floor of bus to ceiling must not be less than 5-ft. 6-in. Top of floor to be not more than 7½-in. above top of chassis frame. Floor boards to be not less than ⅞-in. thick.

Seating Accommodation.—The minimum seating space per passenger must not be less than 15 inches, except that a seat for two passengers only may be of a minimum length of 27 inches. The maximum height of seat must no exceed 17½ inches measured from floor to top of seat.

Construction of Body.—When chassis frame is less than ¼ inch thick, the cross members must rest on fore and aft runners not less the 3-in. deep by 2½-in.

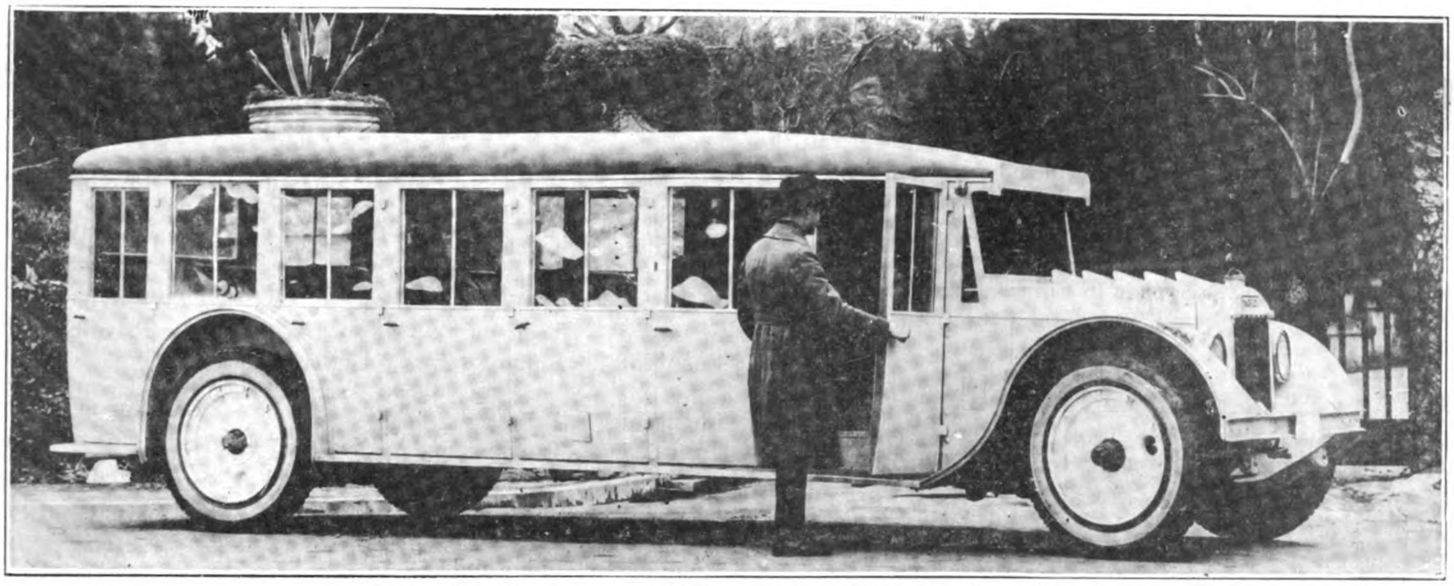
Each runner to be secured to chassis frame by not less than 3 clips. The clips to be not less than ⅝-in. iron with a plate of not less than 2-in. by ½-in. on the bottom side held in position by nuts. When the clips pass round the frame a wooden block must be tightly fitted into the frame in such a manner that it is impossible to remove it without taking off the clip. The body must rest on cross members spaced not more than 3 feet apart.

The cross members to be not less than 3-in. deep by 2½-in. cross section and secured to the fore and aft runners by bolts of not less than ½-in. dia., washers to be fitted under head of bolt and nut.

The fore and aft frame of the body must not be less than 2½-in. deep by 3-in. cross section timber properly secured to the cross members by bolts of not less than ½-in. diameter, iron washers to be fitted under head and nut of bolts. The upright member of the body must be properly secured to cross and longitudinal frame by angle bars or gusset plates. The top of body must be secured to the sides of body in a like manner.

No omnibus when complete in running order for the road but without passengers, driver or conductor shall weigh more than 4 tons. Ample clearance must be provided between top of wheels and body, if necessary by providing buckets in floor.

N.B.—Where sizes are given it is assumed that best quality, chengie, balau or teak wood are used and other materials are of the best and strongest kinds and if such are not used sizes must be correspondingly increased.



The Popular Fageol 20 Passenger " Safety Bus " on 188-in. Wheelbase Chassis.

Safety Bus for Chinese Roads

THE rapid construction of motor roads in China and elsewhere in the Far East is calling more and more for a passenger bus that permits of easy entrance and exit, and ability to crowd as many passengers as possible in a limited space. Highway transportation which has made such phenomenal strides in other parts of the world, is destined to be the solution to traffic congestion in China, and there more than in any other part of the world, luxury must give place to carrying capacity. The greatest efficiency cannot be obtained by the use of rebuilt touring cars or trucks A specially designed bus built up on a special chassis seems the only manner by which a passenger bus can be turned out to meet peculiar Chinese and Asiatic requirements, and here the Fageol Motors Company, of Oakland, California, claim to have scored over other manufacturers.

The Fageol 20-passenger safety bus an on 188-in. wheelbase chassis, with its ease of entrance obtained in the "Safety" stage by the use of a wide running board, extending inside the doors and body sides invites the confidence of people who are otherwise adverse to motor transportation. This passenger stage is designed for hard service at low operating expense. It is neither a truck which has been equipped with a stage body, nor is it a rebuilt passenger car, but a stage body on a stage chassis, built for running 100,000 miles without an overhauling. The Fageol special school bus, the latest addition to their line, is peculiarly adapted for ordinary highway traffic in China, being designed for safety, strength, dependability and economy, providing every possible protection for the passenger.

The future popularity motor transportation, especially in China, depends upon safety, perhaps more than any other consideration. The Fageol "safety" bus is built with a very low centre of gravity and a wide tread of 70-in. This freedom from danger of overturning is of vital importance to both passenger and stage operator.

These buses are equipped with a Fageol Hall-Scott, 4 water cooled cylinders cast in block. Detachable overhead valve and cam shaft head with single cam for both intake and exhaust. Bore 4¼-in. by 5½-in. stroke. Horse-power, 28.9 S. A. E. rating, actual 62 h.p. at 1,800 r.p.m. Three point suspension on thermoid pads. Maximum motor speed of 1,800 r.p.m. controlled by enclosed governor.

Passenger Autos in China

THERE are 6,866 passenger cars, 437 trucks and 792 motor cycles in the various cities of China, according to a conservative estimate, based on the most reliable figures available, by Commercial Attaché Arnold, Peking. It is difficult to ascertain what percentage of the cars are of American make, but the fact that the United States furnished 47 per cent. of the motor vehicles imported in 1918 (641,346 Haikwan taels worth), 59 per cent. of those imported in 1919 (1,404,388 taels worth), and 57 per cent. of the imports in 1920 (amounting to 2,191,644 taels) may serve as the basis of an estimate.

Shanghai had on January 1, 1922, a motor population of 3,242 passenger cars (of which 30 were electric) and 536 motor trucks. The total 3,778 constitutes an increase of approximately 30 per cent. over the number in use on January 1, 1921. It has been calculated that approximately 87 per cent. of these cars are American, of which 10 well-known American makes contitute 71 per cent.

The following table shows the growth in the number of motor vehicles licensed in fhe French concession, Shanghai, from 1913 to 1921 :—

Kinds of vehicles.	1913	1914	1915	1916	1917	1918	1919	1920	1921
Motor cars :									
Private	89	104	135	180	272	336	346	503	698
Public	—	—	77	83	97	121	192	250	307
Commercial	3	3	2	4	6	6	6	11	17
Trucks	—	—	—	—	—	—	2	127	206
Motor cycles	4	5	6	7	11	16	18	31	34
Total	96	112	220	274	386	479	564	922	1,262

These figures, while comprising only a part of the city of Shanghai, illustrate the increasing popularity of motor vehicles.

Good Roads in China

THIS list bears no claim to accuracy or comprehensiveness. The responsibility for road construction in China is vested in so many authorities, governmental, provincial, or private, that a complete record is impossible to obtain. However, all the particulars in this survey have been verified either from a responsible government department or from the offices of private road constructors, and the list may be taken as the foundation of a complete statement which, as time goes on, it will be possible to publish.

The following is a list of roads in China actually constructed, under construction, or projected, and suitable for motor transportation :—

From	*To*	*Condition*	*Mileage*	*Builder*
CHIHLI				
Peking	Yuchuanshan	Constructed		Government
Peking	T'angshan	,,		,,
Kalgan	Urga	,,	643	Ministry of communications
Kinghsien	Tehchow			
Tsangchow	Shihkiachwang	,,	139	Ministry of communications
Tientsin	Paoting	,,	75	American red cross
Fowchenmen	Sankiatien	Under construction		Private
Taming	Hantan	Constructed	46	American red cross
Hantan	Kwangteh	Under construction		
Kalgan	Dolon-nor	Projected	219	Ministry of communications
Kalgan	Shantu	,,	125	,,
Peking	Tientsin	Under construction	72	American red cross and government
Pingtichuan	Taoling	Projected	63	Ministry of communications
SHANTUNG				
Tsinan	Lokow	Constructed	6	Private
Chefoo	Weihsien	,,	180	Governmental
Tsaochwang	Ichow	,,	150	Provincial
Tehchow	Nankunghsien	,,		Private
Yellow River	Road and branches	,,	123	American red cross
Chefoo	Weihaiwei	Projected		
Chefoo	Haiyang	,,		
Tehchow	Lingtsing and Kwantao	,,		
SHANSI				
Taiyuan	Taiku	Constructed		
Pingting	Cheng-Tai Rly.	,,	78	American red cross
Kueihua	Paotowchen	,,		
Tatung	Taiyuan	Under construction		
Taiyuan	Kohsien	Projected		
Taiyuan	Pingyang	,,		
Pingyao	Fenchow	,,		
Yangchuan	Liaochow	,,		
HONAN				
Siping	Yencheng	,,		
Yencheng	Chowkiakow	,,		
Kweiteh (Honan)	Pochow (Anhwei)	,,	45	Private
Shenchow	Sian (Shensi)	,,	156	Provincial

From	*To*	*Condition*	*Mileage*	*Builder*
SHENSI				
Sian	Tungkwan	Projected	100	Governmental
Tungkwan	Shenchow (Honan)	Under construction	54	Private
KIANGSU				
Shanghai	Woosung	Constructed		Provincial
Susieh	Hsuchow	,,	80	Private
Nanking	Tangshan Hot Springs	,,		Private
Shanghai	Cheling	,,	23	Provincial
Shanghai	Tachang	,,		Private
Changshu	Liuho	Under construction		
Changshu	Taitsang	,,	23	Private
Tantu	Tanyang and Nanking	Projected		Provincial
Kuyung	Kingtan and Nanking	,,		,,
Kiangpu	Luho and Nanking	,,		,,
Chinkiang	Tsingkiang	,,		Private
Tsingkiang	Nantungchow	,,		,,
Nantungchow	Haimen	Constructed		
Soochow	Taitsang			
Soochow	Fooshanchen	Projected		,,
Tsingkiang	Hsuchow	,,		,,
Tsingkiang	Haichow	,,		,,
Tsingkiang	Pukow	,,		,,
Soochow	Huchow	,,	245	,,
Yangchow	Kwachow	,,	11	,,
Kiangying	Wusih	,,		,,
Yangssuchiao	Lulichiao	,,		,,
CHEKIANG				
Kashing	Chapu	,,		
Ningpo	Tzeki & Chinhai	,,		
Huchow	Kwangteh	,,	35	
Haining	Changan station	,,		
Sincheng-kwan range	Changchen of Shangyu	,,	67	Provincial
Hangchow	Yuhang	,,		
Changshan	Yushan (Kiangsi)	,,	27	
Hangchow	Shanghai	,,		Private and provincial
Chaoan	Futing	Under construction	350	Provincial
Fengshih	Kwangtseh	Projected	505	,,
Nanyu	Hokow	,,	342	,,
Haiteng	Wuping	,,	178	,,
Fuan	Shaowu	,,	238	,,
KIANGSI				
Nanchang	Kanchow	,,	275	,,
Nanchang	Kwangsin	,,		,,
Nanchang	Ningtu	,,		,,
Nanchang	Kingtehchen	,,		,,
Nanchang	Shangkao	,,		,,
Nanchang	Pinghsiang	,,	Total 1,200	,,
KWANGSI				
Lungchow	Shuikow	Constructed		,,
Nanning	Wuchow	Projected		
Kweilin	Monkong	,,		
KWANGTUNG				
Sunwui	Kongmon	Under construction		,,
Sunwui	Pakhoi	Projected		,,
Sheklung	Lohfoshan	,,		,,
Lohfoshan	Tsengshing	,,		,,

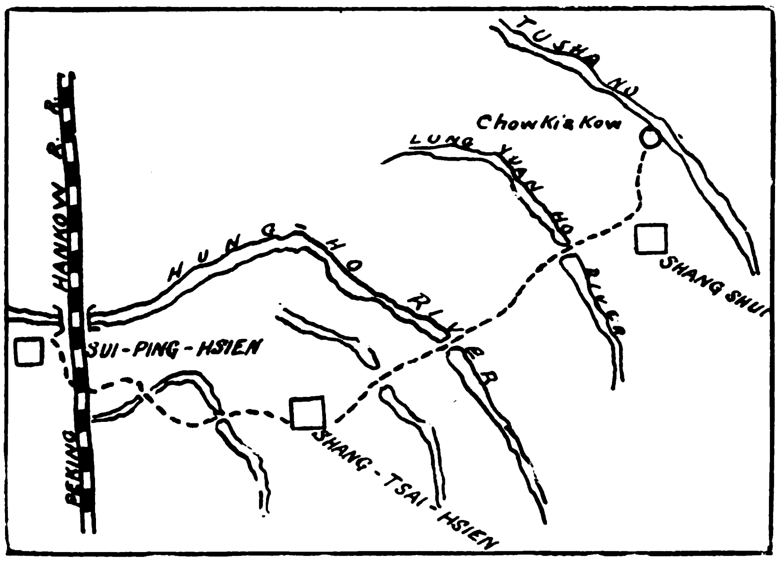
From	To	Condition	Mileage	Builder
Szechuan				
Chengtu	Yachow	Constructed		Provincial
Chengtu	Kwanhsien	,,		,,
Chengtu	Chungking	Projected	265	,,
Chengtu	Pachow	,,		,,
Chengtu	Wanhsien	,,		,,
Chengtu	Kwangyuan	,,		,,
Hunan				
Changsha	Siangtan	Constructed		,,
Fengtien				
Hsifeng	Kaiyuan	Projected		
Anhwei				
Kwangteh-chow	Szean	,,		,,
Wuhu	Suanchen & Kwangteh	,,		,,
Pochow	Suchow	,,	80	,,
Anking	Luan	,,		,,

Distances, where given, are in English miles.

(*Government Bureau of Economic Information.*)

Suiping-Chowkiakow Motor Road

THE magistrate of Shangtsai-hsien, Honan, is planning to construct an automobile road from Suiping to Chowkiakow, with the city of Shangtsai-hsien as the centre. The distance to the Peking-Hankow railway station at Suiping on the north-west, is about 57 *li*, and to Chowkiakow on the north-east, about 110 *li*. The road will have a width of 16-ft. and be macadamized. Ditches will be dug on both sides and trees planted. In addition to the automobile road, there will be built another byway, 1-ft. lower than the minor road, 6-ft. wide, for heavy traffic.



Sketch Showing Line of Projected Motor Road

It is estimated that the section from Shangtsai to Suiping (57 *li*) will call for 5,000 *fong* of earth filling as a cost of $400, 10,000 *fong* of gravel at $25,000, and 500 *fong* of sand at $500, and from Shangtsai to Chowkiakow (110 *li*) 10,000 *fong* of fill at $800, 19,000 *fong* of gravel at $43,500 and 1,000 *fong* of sand at $1,000, or a total of $71,200 to complete the whole road. In the above figures the cost of bridges is not included.

When the scheme is approved, a road construction department will be created to carry out the work; and when completed, the department will enjoy an exclusive privilege for operating a motor transportation service thereon. For private cars and motor trucks a toll will be levied and the proceeds used for maintenance.

Market for Solid Tires in Tientsin, China

THERE is but a limited market for trucks in the Tientsin consular district, the few in use being equipped with solid tires. Until more trucks are in use, so as to enable the buyet to judge the merits as to price, durability and general advantages, it is believed by local dealers that solid tires for trucks will not find a large market in this region. It is estimated that there are about 60 motor trucks in the district, less than 20 of which are in operation. The remainder are either still in stock or are unfit for use.

The future success of the trade in motor trucks in North China depends entirely upon whether or not suitable roads are to be built. Those suitable for motor vehicles in Tientsin, Peking and their environs do not exceed 130 miles in length. Motor cars and trucks are operating on the Gobi Desert run at present, but until the highways are improved the journey, especially for heavily loaded motor trucks, will prove difficult and hazardous. Also, as regards the commercial feasibility of the use of trucks on this route, it is questionable whether they can compete successfully, on account of the low cost of camel and cart hire.

The use of motor trucks in the transport of passengers, to be operated as feeders for railway lines, has possibilities, but this again depends upon the construction of good roads.

Regarding the use of motor trucks in Tientsin, it may be stated that there is likely to be very little demand, for the reason that nearly all the mercantile houses are situated near to the wharf and the railway station, and coolie hire for the carriage of cargo to and from the bund and the railway station is very reasonable. No motor truck could ever hope to compete with coolie hire on a short haul.

Peking is not a commercial centre, and although the distances are much greater than in Tientsin and the mileage of good roads much larger, still there is some doubt as to motor trucks being used to any extent in the city for a long time to come. Motor cars are increasing in number, and no doubt in a few years the use of motor trucks in the delivery of coal and other supplies about the city will become more general. Furthermore, there will eventually be a demand for military motor trucks and motor trucks for bus lines to points outside of Tientsin and Peking. The sale of automobiles, motor trucks, tires and accessories is being vigorously pushed in this district. The advertising commonly resorted to embraces newspapers, both native and foreign, moving-picture screens, billboards etc.

Franklin Touring Car Makes Record in China

A FRANKLIN touring car driven by F. S. Williams broke all previous road records between Tientsin and Peking, China, on March 2, when he made the trip in three hours and nine minutes from East Gate, Peking, to the governor's yamên, Tientsin. The distance between the two cities is 80 miles, and over smooth American highways the time record set up would be nothing out of the ordinary. So far as this particular run is concerned, however, the time is deemed remarkable because the road, which is of none too good construction is only about two-thirds finished, the balance of the route taking the tourists over dykes, along an exceedingly rough car trail or road badly cut up by deep ruts.

Because the Franklin is air-cooled, it has long been a favorite with the military authorities in China, who find they can operate an air-cooled car over stretches of hundreds of miles of desert without stopping "to give it a drink." Until recently it used to take 40 days to make the 700-mile trip across the great desert of Gobi by caravan. The trip is now made easily in four days in a Franklin.

Motors and Roads in the Philippines

WITH a total of about 3,000 miles of first-class roads, the Philippine Islands had 13,341 motor vehicles registered with the bureau of public works at the end of 1921, an increase of 1,865 cars over the preceding year. China possesses 7,000 passenger cars according to the latest compilation, which gives the palm to the Philippines for being the most thoroughly motorized part of the Orient.

The beautiful palm fronded main South Road leading from Manila to Toyabas

Motor vehicles registered, with the bureau of public works at the end of 1921, was as follows :

	Old	*New*	*Total*
Private cars	5,446	1,020	6,466
For hire cars	1,838	228	2,066
Public utility cars	172	5	177
Private trucks	726	146	872
For hire trucks	407	52	459
Public utility trucks	685	61	746
Garage cars	364	33	397
Garage trucks	207	13	220
Government cars	326	49	375
Government trucks	383	67	450
Private motorcycles	682	75	757
Government motorcycles ..	240	116	356
Total	11,476	1,865	13,341

The general business depression was also felt by the automobile trade of the islands. The majority of the cars sold in the past few years have gone to the Filipino planters who with good crops, high prices and plenty of money ordered large numbers of expensive cars which found their way into the country. In addition to this luxury demand, large numbers of motor trucks were sold for freight and passenger transportation purposes, creating a situation seriously menacing the earning capacity of the railways, which are owned and operated by the government. This has had the effect of creating official hostility towards all new public utility motor transportation, evidenced in the decreased number of licences issued during 1921 for such purposes.

The Road System

The road system has reached the point where maintenance is a serious problem and engineers are puzzled over the question of the proper kind of road. At present macadam is in the lead, but the heavy traffic, motor vehicles and bull carts, breaks up the surfacing rapidly. The heavy rains in the rainy season do immense damage, while the long dry seasons permit rapid wear through blowing dust.

The status of roads and the history of road building can be understood through a study of the following table from the bureau of public works :—

PHILIPPINE PUBLIC WORKS STATISTICS

Total Mileage of Roads in the Philippines

	First Class Roads	Increase Per cent.	Second Class Roads	Third Class Roads
1907 ..	(*a*) 303			
1908 ..	423	40		
1909 ..	609	44		
1910 ..	764	25	(*a*) 641	(*a*)2,074
1911 ..	987	29	664	1,837
1912 ..	1,143	16	1,342	1,999
1913 ..	1,303	14	1,264	1,938
1914 ..	1,593	22	1,258	1,787
1915 ..	1,906	20	1,294	1,896
1916 ..	2,137	12	1,271	2,138
1917 ..	2,323	9	1,278	2,109
1918 ..	2,542	9	1,253	1,944
1919 ..	2,796	10	1,234	1,932
1920 ..	2,920	4	1,266	1,914

(*a*) No accurate statistics before 1907 and 1910, respectively.

Years preceding 1914 are for twelve months ending June 30, 1914, and following years are for twelve months ending December 31.

Note.—First-class roads in this table include not only first-class roads officially designated but also first-class roads not officially designated as such.

The accompanying map showing the road system of southern Luzon, the largest of the islands, will give a good idea of the importance of these new roads as a factor in the development of this remarkably rich territory. The main south road from Manila to Lucban is also one of scenic beauty passing through the coconut garden of the Philippines, where as far as the eye can reach are groves of these slim fronded trees affording an ever entrancing vista, while far to the east stands cloud capped Banahao, monarch of Philippine mountains. The trip from Manila to Lukban and return a distance of 100 miles can easily be made in the daylight hours of a single day.

Aviation—France

The traffic of the Bourget Aero Station (near Paris) is increasing considerably, according to *La Journee Industrielle* of April 9-10. In March, 1922 there were recorded 315 airplanes, carrying 846 passengers and 21,908 kilos of merchandise. The corresponding figures for March, 1921, were 250 airplanes with 681 passengers and 8,725 kilos of merchandise.

The Southern Luzon Road System

Courtesy, Bureau of Public Works

Motors and Roads in Siam

AN estimate of the number of motor vehicles in use in Siam to August 15, 1921, gives the total of 1,435 passenger cars and 170 trucks, of which 1,400 cars and 130 trucks were in use in Bangkok, 25 cars and 10 trucks in Siamese Malaya and 10 cars and 30 trucks in northern Siam. Approximately 97 per cent. of all the cars and 75 per cent. of all trucks were in operation in the capital. The imports of cars and trucks into Siam from 1913 to 1921 is as follows :

Countries of Origin.	1913	1914	1915	1916	1917	1918	1919	1920	1921
United States	28	76	25	70	137	102	161	95	185
United Kingdom... ...	46	51	24	17	18	14	4	6	64
France	4	7	2	—	—	—	—	—	35
Germany	41	48	19	—	—	—	—	—	9
Italy	3	4	4	1	3	1	—	—	4
Other countries	3	4	2	1	2	3	5	5	24
Total	125	190	76	89	160	120	170	106	321

The Motor in the Home of the Elephants. The Cliff Gate (Km 50) on the Northern State Highway of Siam No. 3

The above list indicates that American manufacturers are meeting increasing competition. While in the year ending March, 1919, 95 per cent. of the number of cars and trucks imported came from the United States and 5 per cent. from other countries, the proportion was 90 per cent. to 10 per cent. in 1920 and 58 to 42 per cent. in 1921. An important addition to the importations of the year was the arrival from England of a second Merryweather automobile fire engine for the gendarmerie department of 45-50 brake horse-power capable of delivering 300 gallons per minute.

The development of the road program promises to give a stimulus to the automobile business in Siam. The example of British Malaya to the south with its magnificent system of roads and motor transport which acts as feeders to the railways has had a marked effect upon the policy of the Siamese railway department, and although progress is slow, in three years substantial progress has been made along these lines.

Highway Reports for 1921

In the last report on the administration of the department of ways in Siam for the year ending March 31st, 1922, the minister of communications emphasizes the great reduction in the costs of transportation with a consequent tendency to a greater volume of traffic all over that country as a result of the road program which is now in its third year. This is held to fully justify the government measures for continuing the work for improved communications.

Previous to the adoption of the new program, the confinement of highway administration for so many years within the narrow framework of local considerations had militated against the adoption of a broad comprehensive outlook which transport requires. Construction work under the new program, especially in the case of certain long-distance highways, has not yet had the time to advance so as to fully develop traffic and trading possibilities, but signs are not wanting that highways suitable for rapid forms of transport are going to contribute in a large measure to the rapid economic development of the country.

During the year under survey, Purachatra, the commissioner-general of state railways in charge of the department of ways, made an extended trip to Europe and America for the purpose of studying road-making practice and investigating the different types of road-making machinery that could be used to advantage in Siam. The total amount expended for the three years in road-making machinery and tools amounted to Tcls. 144,869, and for the year Tcls. 66,052. During the year under review the sum of Tcls. 1,470,127 was expended, of which Tcls. 604,551 was for construction account, Tcls. 532,598 for improvements, and Tcls. 270,241 for maintenance proper.

To the southern highway division containing the more important roads a sum of Tcls. 719,434 was devoted, to the northern, Tcls. 521,308, and to the central system containing mostly cart tracks, Tcls. 142,700. The total amount expended on highways under the new administration for the three complete years amounted to Tcls. 3,515,984.53.

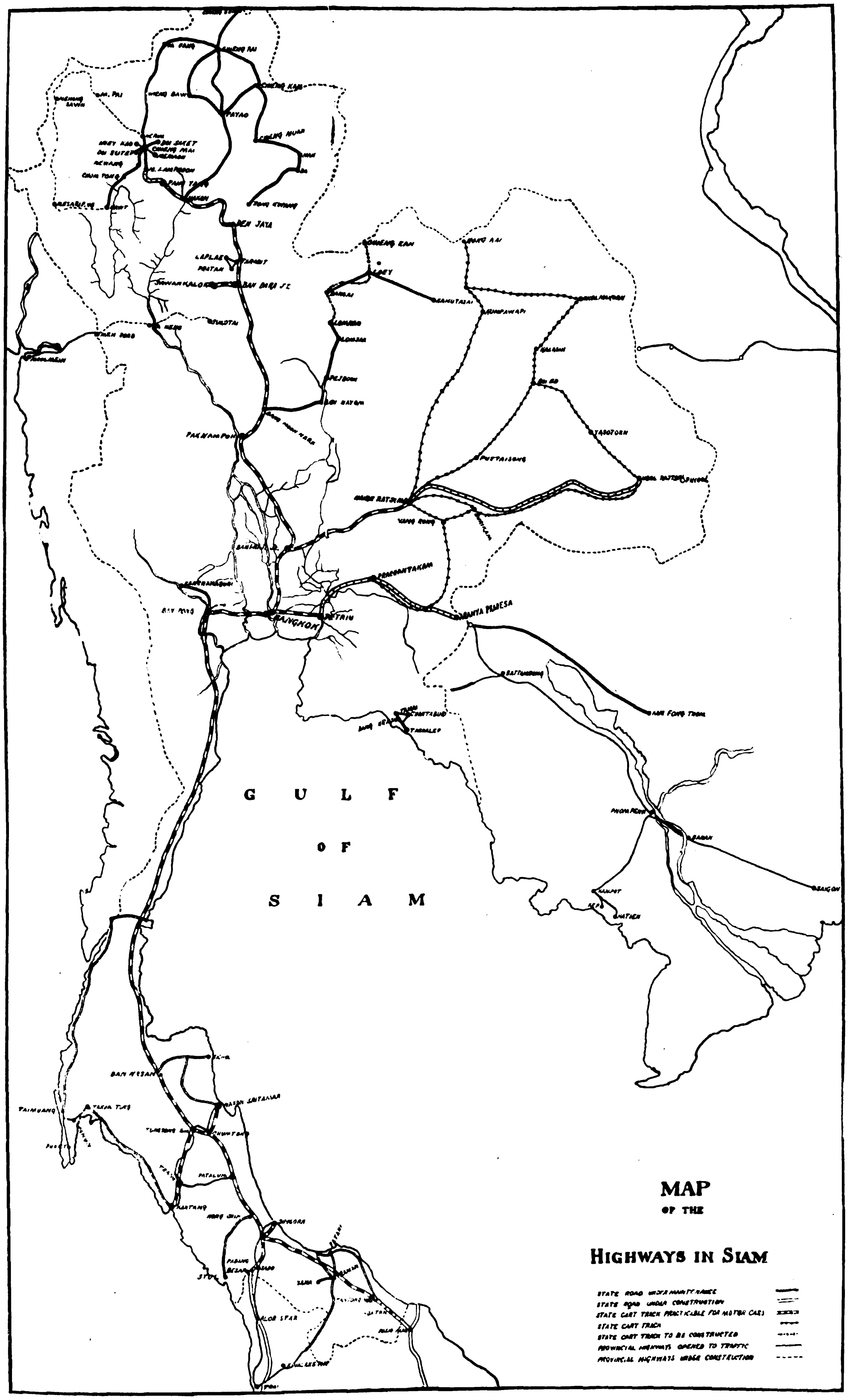
The report shows a total of 3,676 kilometres of all classes of roads under maintenance, improvement and construction in Siam, an increase of 109 kilometres over the preceding year. Of this total 420 kms. is in the northern division, with 57 kms. of second class, 290 kms. of third class and 73 kms. of cart tracks. The central division with 2,095 kms. has no first or second-class roads, but has 47 kms. of third class and 2,048 kms. of cart tracks. The southern division, with a total of 1,161 kms. has 83 kms. of first, 57 of second, 406 of third and 615 kms. of cart tracks.

The detailed list of the state highways is as follows:

NORTHERN DIVISION

No.	Between	Length of Highway Maint.	Impro.	Under Const.	Total Length	Class.
1	Den Jaya—Phrae	25	—	—	25	II
2	Lampun—Chiengmai ..	28	—	—	28	II
3	Lampang—Chiengrai ..	39	—	206	245	III
4	Chiengmai—Mae Rim ..	—	15	—	15	C.T.
5	Chiengmai—San Kambaeng	4	9	—	13	III
6	Chiengmai—Doi Saket ..	—	10	—	19	C.T.
7	Chiengmai—Mae Tachang	—	14	—	14	III
8	Swankaloke—Sukodai ..	—	—	39	39	C.T.
10	Utaradit-Phra Taen-Laplae	—	22	—	22	III
	Total ..	96	79	245	420	

The old state highway No. 9 (station to Lampang) has been merged into northern state highway No. 3 and forms part thereof.



MAP
OF THE
HIGHWAYS IN SIAM

CENTRAL DIVISION

No.	Between	Length of Highway Maint.	Impro.	Under Const.	Total Length	Class.
1	Bang Moon Nak-Petchabun	—	—	112	112	C.T.
2	Pak Preo—Hnong Kae ..	—	22	—	22	C.T.
3	Chandhaburi—Tha Chalaeb	—	—	12	12	III
5	Korat—Prachin	—	371	—	371	C.T.
6	Korat—Skol Nagara ..	—	405	—	405	C.T.
7	Bantum—Ubol	—	353	—	353	C.T.
8	Ubol—Roi Et	—	172	—	172	C.T.
9	Udara—Skol Nagara ..	—	162	—	162	C.T.
10	Korat—Knong Kai ..	—	391	—	391	C.T.
11	Pimul—Chong Mek Pass ..	—	—	35	35	III
12	Nang Rong—Buriram ..	—	60	—	60	C.T.
	Total ..	—	1,936	159	2,095	

SOUTHERN DIVISION

No.	Between	Length of Highway Maint.	Impro.	Under Const.	Total Length	Class.
1	Chumporn—Tap Lee ..	—	—	51	51	C.T.
2	Thanun—Takuapa ..	—	24	69	93	III
3	Kok Kloi—Kalai	—	17	—	17	III
4	Setul—Kuan Niang ..	—	40	46	86	III
5	Tongkha—Laem Kuan ..	35	—	10	45	II
6	Tongkha—Sala Ket Ho ..	12	—	—	12	III
7	Tongkha—Ban Rangaeng	18	—	—	18	III
8	Ban Ta Rua—Ban Bang Tao	8	—	4	12	II
9	Kan Tang—Patalung ..	—	96	—	96	III
10	Trang—Nagara (Ta Bae)	—	136	—	136	C.T.
11	Songkhla—Sadao	83	—	—	83	I
12	Ban Ko Hongse—Haad Yai	—	—	5	5	III
13	Raman—Kabu	—	10	—	10	C.T.
14	Patani—Yala	—	46	—	46	C.T.
15	Patani—Raman	—	75	—	75	C.T.
16	Patani—Tanjong Mas ..	—	122	—	122	C.T.
17	Yala—Yaha	—	11	—	11	C.T.
18	Ban Pong—Kanjanaburi ..	—	—	51	51	III
20	Sadao—Padang Besar ..	—	—	12	12	III
21	Yala—Betong	—	—	118	118	C.T.
22	Nagara-Rong Lek (Nobpitam)	—	—	46	46	C.T.
	Roads in Renong	—	16	—	16	III
	Total ..	156	593	412	1,161	

Personnel

The Siamese department of ways is under the ministry of communications at the head of which is H.E. Chao Phya Wongsa Nuprabadh, with head offices at Bangkok. The chief highway engineer is Phya Sarasastra Sirilakshana, with headquarters at Bangkok. The headquarters of the northern division is at Lampang, with Mr. G. Canova as chief construction engineer. The central division headquarters is at Bangkok under the direction of the chief engineer. The southern division is in charge of Mr. E. Wyon Smith.

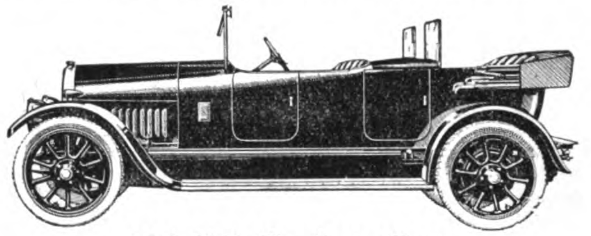
All Imperial Airship Scheme

Strong support is being given by industrial interests in Great Britain to the scheme for establishing a commercial airship service between Britain, India and Australia. It is confidently expected that the British air ministry will recommend the government to assist this enterprise, for which detailed and promising estimates have been drawn up. Meanwhile the speed of British air services to and from France is increasing. Recently a record was established by a British machine on which four successive single trips between London and Paris were made in the interval between 6.55 a.m. and 5.40 p.m. Out of $10\frac{3}{4}$ hours between the first ascent and the last descent 8 hours 52 minutes were actually spent in the air. The total distance covered was about one thousand miles.

Humber

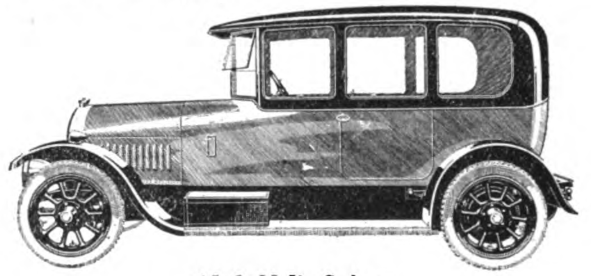
The Famous 15.9s

At all Motor Shows the Humber 15.9 h.p. models have elicited a chorus of praise. The Motor Editor of *Country Life* made a striking reference to the engine. "A smoother running engine," he said, "than the four-cylinder 15.9 h.p. Humber it would be difficult to conceive, and the flexibility makes one wonder whether the undoubted charms of the six-cylinder are really unobtainable by other means. The 15.9 engine is large enough to satisfy every demand that the normally-minded owner can make."



15.9 H.P. Five Seater Tourer

An entirely new note is struck in the All-Weather Feature attached to the open models—a real boon to Motorists. In a few seconds an open car can be converted into an All-Weather vehicle, thoroughly wind and weatherproof and attractive in appearance.



15.9 H.P. Saloon

A Triumph of engineering skill and accomplishment is the 15.9 h.p. Humber Saloon. It is the best of its kind; perfect in design, material, and workmanship, and remarkable alike for the superiority of its engine power, ease of control, and great refinement in appearance.

Models for 1922

11.4 H.P. 2-Seater (with double Dicky Seat) **11.4 H.P. Coupe** (with double Dicky Seat)
11.4 H.P. 4-Seater Touring Car **11.4 H.P. Saloon**
15.9 H.P. 5-Seater Touring Car
15.9 H.P. Saloon de Luxe

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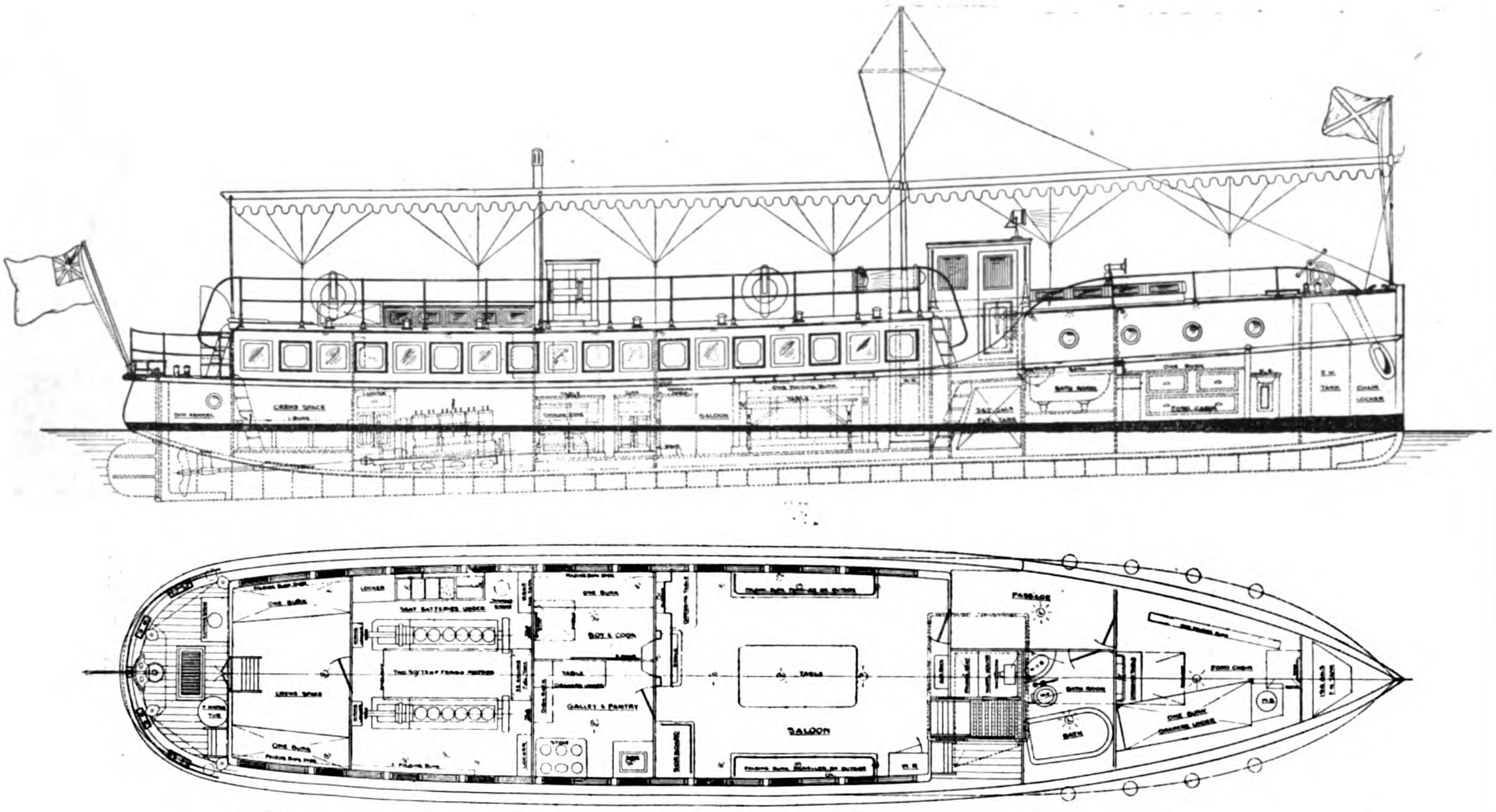

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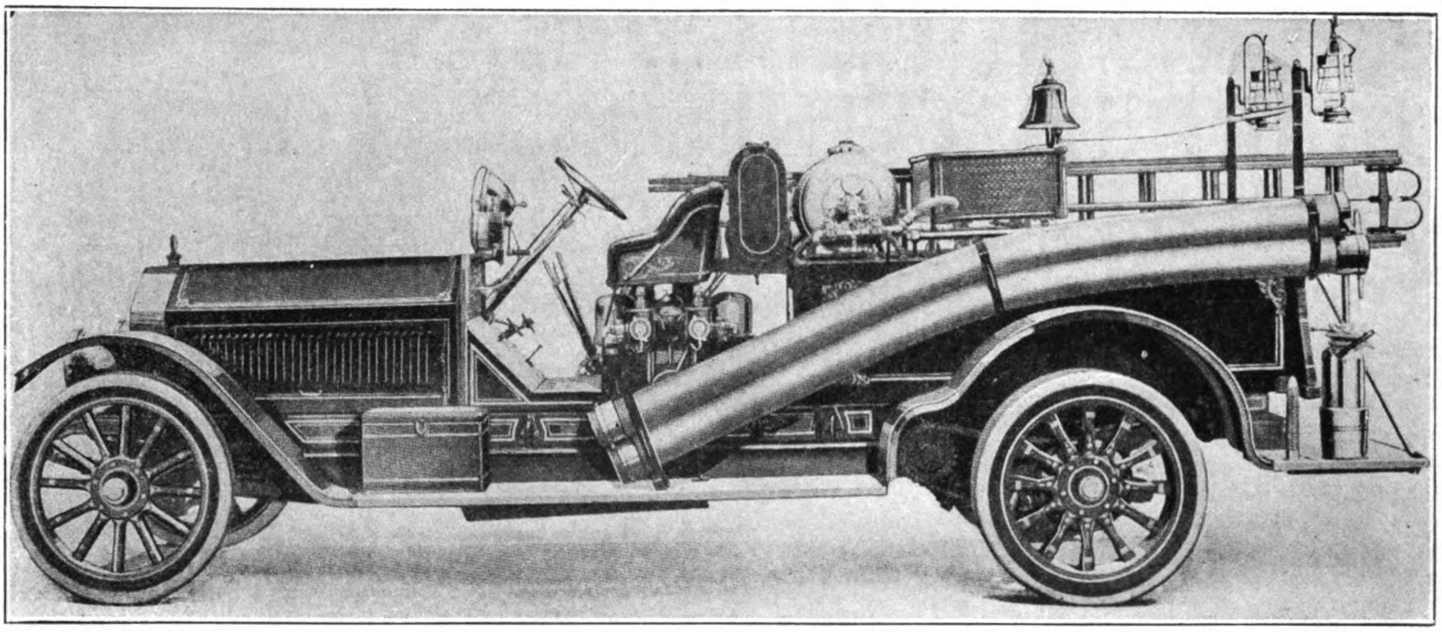


Triple Combination Pumping, Chemical and Hose Car, equipped with Rotary Gear Pump—1000 Gallons Capacity made by the American-La France Fire Engine Co., Inc.

Modern Fire-Fighting Apparatus

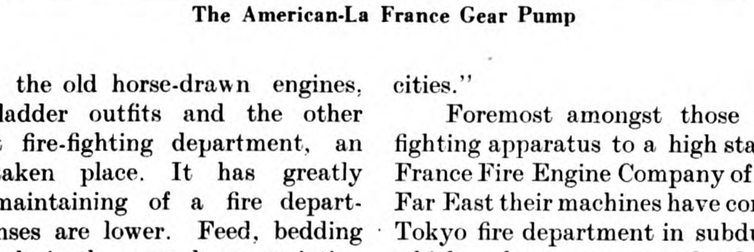
THE days of the old horse-drawn steam fire engines and trucks are rapidly passing, giving place to the more efficient motor-driven apparatus. Writing in *American Exporter*, Mr. Geo. W. Sutton, Jr., says that " in all parts of the world the elimination of horse-drawn fire-fighting equipment and the installation of motorized apparatus is taking place. The increased efficiency of motor-drawn fire-fighting vehicles, an increase which has been estimated at fully 40 per cent. in some of the world's largest cities, is rapidly making obsolete the use of horses for this vital service. Motorized equipment is, perhaps, less picturesque than that drawn by horses, but its cost is so much lower and its efficiency so much greater that progressive cities everywhere are turning to the newer method of fighting fires.

"One of the greatest elements in combating fires is that of quick action in attacking the flames. In this important matter the motor-driven fire truck stands pre-eminent. The motor fire engine can arrive at a fire and have the fight well under way before the horse-drawn engine has covered half the distance from its stationhouse. Through its characteristic speed in answering alarms, the motorized fire department is able to check fires before they grow large, cutting down the loss of life, property and money which all cities suffer through disastrous fires.

" Wherever a city has substituted motorized apparatus for the old horse-drawn engines, trucks, hose wagons, hook and ladder outfits and the other necessary parts of an efficient fire-fighting department, an immediate improvement has taken place. It has greatly reduced the taxes, due to the maintaining of a fire department because the operating expenses are lower. Feed, bedding and veterinary attention figure largely in the annual appropriation for a fire department employing horses. In the case of the motorized department these expenses are eliminated and the cost of gasoline, oil, tires and repairs has been shown to represent a saving over the former method. A city which once adopts motorized fire apparatus never goes back to the horse-drawn machines.

" Motorization plays an important part in fire prevention work. In the city of Detroit, Michigan, during the past year 35,000 inspections were made to discover and correct fire hazards. According to the chief of the Detroit fire prevention bureau, this would have been absolutely impossible without the aid of a highly mobile and efficient motor squad. As a result, Detroit suffered from 508 fewer fires in 1921 than it did in the previous year and reduced its fire loss more than $1,000,000.

" Not only does the motorization of fire departments increase the personal comfort and better working conditions for the firemen, but it enables them to do better work. It enables them, for instance, to get into action, after reaching a fire very much more quickly than in the old horse days. With a motor-driven fire engine, it is possible to get up the proper amount of water instantaneously.



The American-La France Gear Pump

" The installation of motorized fire apparatus is a thoroughly modern step in progress. It is going forward rapdily in all parts of the world and, before long, the use of motor equipment for this purpose will be universal in all progressive cities."

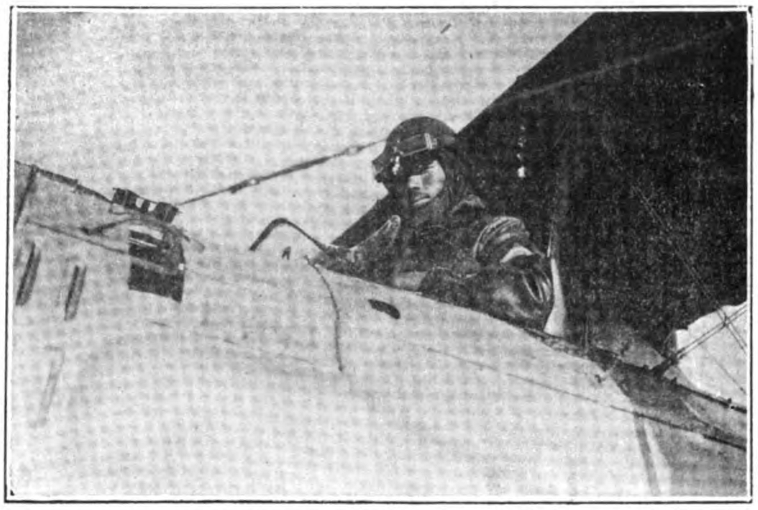
Foremost amongst those who have developed modern fire-fighting apparatus to a high state of efficiency, is the American-La-France Fire Engine Company of Elmira, New York, and here in the Far East their machines have contributed largely to the success of the Tokyo fire department in subduing and controlling the large fires, which, when once started, threatens to wipe out whole wards in that city of frail wooden buildings.

Aviation in Japan

A New Opening for American Machines

FOR the first time since the war it may be said that the Japanese market for aerial machines has opened up opportunities for American manufacturers. The Washington conference amongst other things, has given Americans an opportunity of selling in this market which they did not possess while it looked as though hostilities between the two countries might be precipitated as the result of the misdirected campaign of those who seemed to think that it devolved upon America to draw a cordon around the island empire. British, French, and aviators from other countries, were attracted to Japan and much capital was made out of the possibility of war with America. It ruined all hope of American manufacturers gaining a foothold in this market. Conditions have changed, and the demand for aerial transportation now manifested in Japan carries with it an opportunity for Americans which did not exist before.

The Japanese-American war scare was responsible for great activity in aviation in Japan, providing manufacturers of other countries an exceptional opportunity of getting their machines placed in this market. At the height of this agitation, it was currently reported in British aviation circles that the Avro Company had over a hundred training machines on order for the Japanese government, in addition to which, the latter had paid the same company the sum of £30,000 for the drawings and manufacturing rights of the standard Avro biplane. Forty Nieuport "Nighthawks," 40 "Sparrowharks" and a number of Nieuport "London" triplanes were reported to have been ordered from the Gloustershire Aviation Company. In addition, Short Brothers sold a dozen or so seaplanes for training, while some of the best of the Sopwith and Handley Page technical experts went to Japan to lay out the Japanese naval aircraft factory and organize production. From the accounts printed in the British and French technical press at that time, there is little doubt that full advantage was taken of a situation that hermetically closed the Japanese market to American aircraft manufacturers. With the Chinese government market closed to others by reason of the Vickers loan, the American manufacturer was quietly but effectively edged out of the Far East. The lead in these markets passed to Great Britain and France. The Washington conference has provided an opening for American manufacturers to retrieve their lost ground.



Mr. Yota, Famous Japanese Aviator

The Imperial Aeronautic Association

One of the most stimulating influences upon aerial transportation in Japan is the Imperial Aeronautic Association of Tokyo, having for its main object the development of aeronautical science and aerial machines for private and commercial use. Prince Kuni is president of this organization, Baron Y. Sakatani, vice-president and the directorate is composed of about thirty prominent personages.

The director-general of the association is Lieut.-General Kuno. The sum of Y.500,000 has been bestowed upon the Association by the imperial court out of the civil list. It was proposed to raise contributions amounting to Y.2,000,000, but bad times intervened, and the financial assets of the association now amount to only Y.720,000, including Y.470,000 the balance of the imperial grant. Apart from the imperial grant, Y.100,000 has to remain untouched as a foundation fund. The funds now in the treasury amounts to only Y.150,000.

Next year, an international aerial contest is to be held in Japan by aviators from Great Britain, the United States, France, Italy and Japan. At least Y.300,000 will be required, and the Association is at a loss as to how to raise the necessary funds. The popular subscriptions up to the end of 1921 were less than Y.500,000. The total appropriations for aerial corps of both Japanese army and navy during 12 years up to 1921 were Y.76,020,000, inclusive of Y.41,030,000 for last year, as against Y.120,000,000 for France and over Y.100,000,000 for the United States, both for the same year. An American tourist visiting Japan regretted to see aeronautics still toddling in infancy, and contributed Y.176,000 in two instalments.

France is allowing an annual grant of Y.3,000,000 and Great Britain Y.2,600,000 in support of private airmen, while Japan is giving only Y.50,000 for this purpose. As to aerodromes, Great Britain has 108 private aerodromes and France, 57, whilst Japan has not one.

Notwithstanding the rather gloomy picture presented by the above figures relative to the aeronautical association, other private interests are making headway.

Private Activities

The establishment of an aerial training school in Nagoya, and the organization of a lake aerial excursion company is contemplated by a civilian aviator of Kyoto. The latter is planning a visit to the United States for the purpose of purchasing a 400 h.p. eight-seater plane.

The reopening of a civilian aviation school at Nagoya, which was temporarily closed, is being planned.

The Mitsubishi Motor Company at Nagoya has made progress in the work of manufacturing the new Mitsubishi type of airplane, and will soon be turning out complete machines. The company's application for permission to establish an aviation field in front of its works at the port, has received official sanction.

A trial flight with an experimental airplane completed by these works, and in which a 300 h.p. Hispano-Suiza motor was installed, showed satisfactory results. While the details of the machine's construction are kept secret, it is said to be a high-speed fighting plane.

Work has been begun by the Aichi Tokei Denki Kabushiki Kaisha (Aichi Clock & Electric Machinery Company, Limited), on a factory in the neighborhood of Nagoya, to which the works of the company, now at Atsuta, will be moved later on. It is expected that it will be completed by the end of 1922. The present

works are capable of turning out one airplane a month, of the Yokosho type ; the new factory will have a capacity of 50 planes a month. Special attention will be given to the production of large commercial planes.

The Kawasaki Works of Kobe are contemplating the erection of airplane factories in the Gifu prefecture. Construction was scheduled to be started in November, 1921, and to be completed in the spring of 1922, when 500 workmen will be detached from Kobe to engage in the manufacture of airplanes.

General Notes

An aerial passenger service will be established between Tokyo and Osaka the latter part of the summer if the plans of a wealthy Japanese of Hamamatsu prove successful. He is reported to have made application to the national government for permission to establish the service and that his request was granted. According to his plan he will charge Y.90 for the trip between the two cities and will make the trip in three hours.

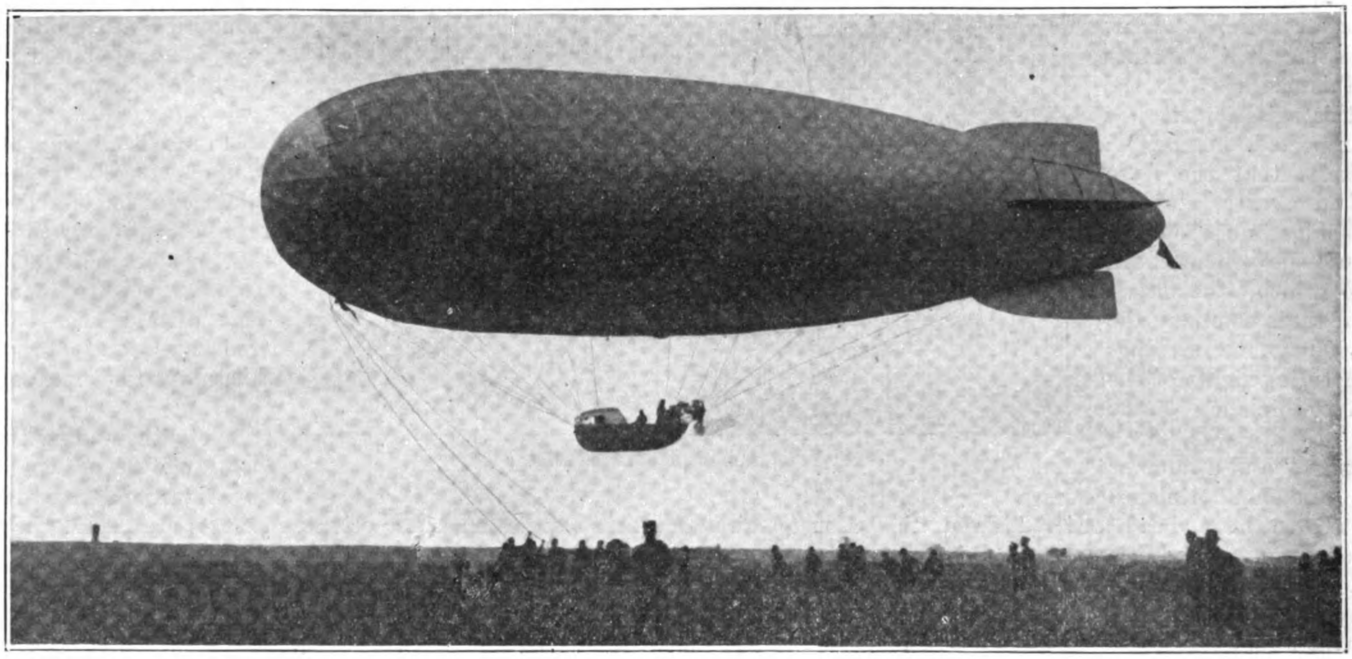
The greatest activity in opening up aerial routes in Japan seems to be in developing connections with Manchuria. Several flights have been made between Japan and Dairen to date. There has also been some talk about the establishment of a supplementary air mail service between Nagasaki and Shanghai to operate in conjunction with the steamship services of the Nippon Yusen Kaisha. The indications are, however, that unless such a service receives a liberal government subsidy no company will attempt to carry out a scheme which cannot hope for profitable returns as a purely commercial venture.

The Yokosuka naval station aero division successfully carried out a 1,400-mile flight on April 2, 1922, starting from Yokosuka and returning after visiting such places as Kure, Sasebo, Kagoshima and Wakanoura in South Japan. Three F. No. 5 aeroplanes took part in this flight.

Miss Seiko Hyodo, 24 years of age, successfully passed the Japanese government examination for a licence to pilot an aeroplane. She was given a third-class licence, the first woman to be licensed as a pilot in Japan.

Incombustible Paints Invented

One of the frequent causes of accidents to aeroplanes is fire. The authorities of all countries interested in aviation have made great efforts to discover some paint which shall make aerpolanes incombustible, so that when the plane is hit by shells, it will not catch fire. The national research laboratory of Osaka has produced an incombustible paint, the main feature of the invention being a fibre treated by acetic acid dissolved in acetone. When this mixture is spread on the plane the aceton evaporates and the fibre is left as a film covering the body. This film is incombustible.



Smallest Airship in the World

ABOVE is a view of the Societa Costruzioni Aeronautiche dirigible, the smallest airship in the world, which was designed by experts of the Italian army service. This new craft is only 117-ft. long and 25-ft. wide and is capable of traveling 45 miles an hour. It is designed especially for light express service.

The S.C.A. dirigible is provided with two engines, type Anzani, which is the same kind as was used by Bleriot when he made his historic flight across the channel in 1911 ; these engines are of 40 horse-power. With one engine running, this dirigible can attain a speed of 35 miles an hour, and with two engines as high as 50 miles an hour are attained. Fully loaded this dirigible with one engine running, making a speed of 35 miles an hour, has a flying radius of 1,300 kilometres ; with two engines, and running at a speed of 50 miles an hour, it has a flying radius of 800 kilometres without stopping.

The S.C.A. dirigible is not intended for passenger service, although it may be mentioned that the first passenger to make a flight in a dirigible of this type was Signor Ferrarin, the intrepid young man who made the flight from Rome to Tokyo something over a year ago.

The gross carrying capacity of this dirigible is 670 kilos. Deducting from this 170 kilos, the average weight of two men, and 100 kilos ballast, there remains a net carrying capacity of 400 kilos, or 880-lb.

The combined consumption of oil and gasoline of the S.C.A. is only 30-lb. per hour and the "bag" only requires a renewal of 20 cubic metres of hydrogen after a day's use. Only two men are required to take it out of the hangar.

The first airship of this type was constructed in the latter part of last year and the first trial took place on the 14th of February this year. The first two airships made were sold to the Spanish government.

Twenty Years of Motor Car Devotion

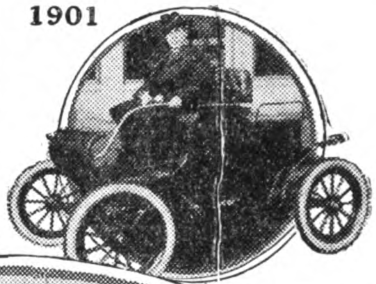
THIS is the story of a man who, for twenty years, has been as devoted to a single make of car—as Damon was to Pythias.

It is the story of a record-breaking fidelity, of ownership so ardent as to be perhaps unparalleled anywhere.

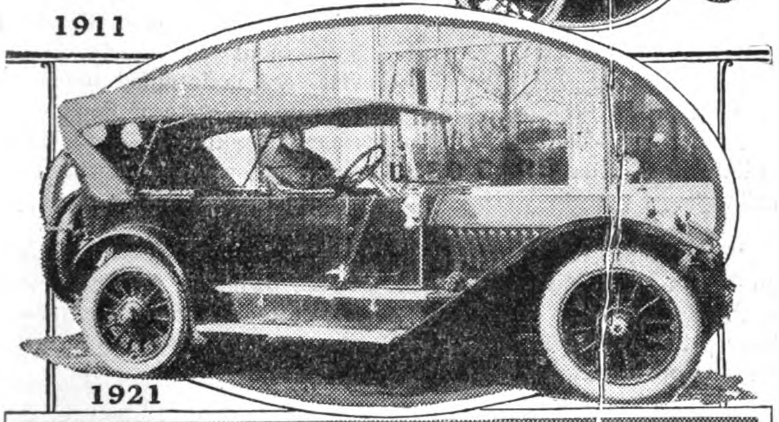
Fittingly enough, this "Damon" who is so remarkable an advertisement for the Oldsmobile motor car, is himself a noted advertising man, Mr. J. P. Muller, president of a large New York advertising agency.

Mr. Muller has gone through two decades of Oldsmobile ownership in New York city. Although the illustrations show him in only three cars, it is nevertheless a fact that he is the only individual on the face of the earth who can claim the extraordinary distinction of having owned a car of each year's output of the Olds Motor Works.

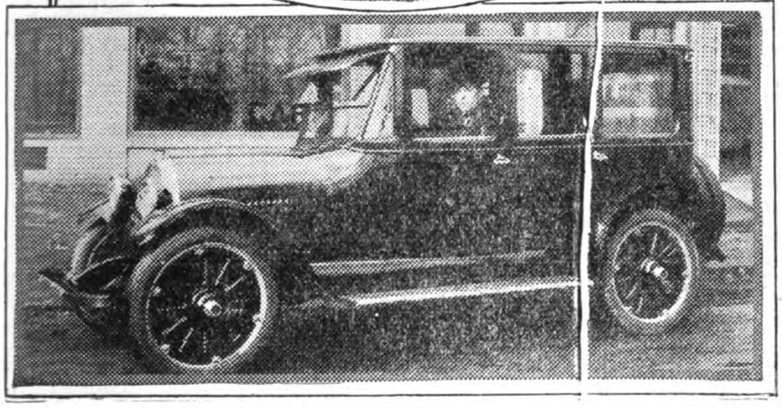
1901



1911



1921



When Mr. Muller was asked what he did with his fleet of Oldsmobiles and what use he could have for such an assortment when it was physically impossible for a man to run only one car at a time, he replied that when he bought a new one, he passed the older one along to relatives. Finally he found himself, his family and his relatives in possession of so many Oldsmobiles that the simplest way to manage his fleet was to go into the garage business.

With some associates he organized the Thoroughfare Auto Supplies, Inc., at Elmhurst, Long Island. Arrangements were made to sell Oldsmobiles and to-day the company is one of the most active in the metropolitan district.

His trio of cars, pictured here, forms an exhibition in the thoroughfare garage that has attracted widespread attention because it shows so graphically the transition through which the automobile has passed, and in which the Oldsmobile has always played a leading part.

Mr. Muller is a keen student of motordom and its affairs. At a convention held in January, Mr. Muller's speech was the subject of considerable comment in the automobile columns of the daily newspapers. He pointed out that in relative value the Oldsmobile "four" of to-day costs less than half of what the 1908 Oldsmobile brought. The older model, Mr. Muller said, had no magneto, no electric lighting equipment and no self-starter. Had this car been equipped with windshield, top, speedometer and the many other sundries which are now embodied in the modern car, its cost would have been over three times that of to-day.

It is a far cry, indeed, from the perambulator type curved dashboard Oldsmobile of 1901, which was the cynosure of all eyes wherever it appeared, to the trim, beautiful, efficient car of the present. It is an equally far cry from the 8 horse-power Oldsmobile to the 90 horse-power machine, the smallest and the largest turned out of the factory at Lansing; but Mr. Muller still owns them both.

Periodic offers have been made him for the two older cars pictured here, but he has refused to part with them under any circumstances. He regards them as precious possessions and inasmuch as he is still in his forties, he hopes to add two or three more decades of Oldsmobiles to the exhibition.

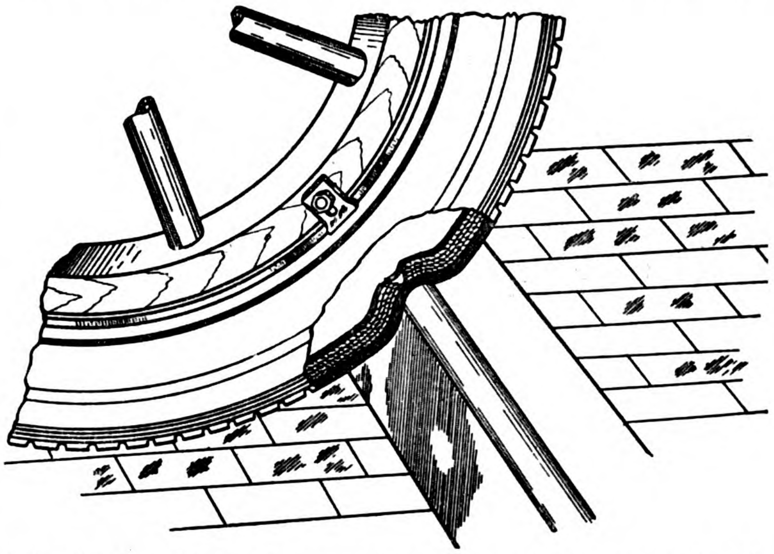
Tire Bruises

A "STONE bruise" is the term used to describe an injury to a tire caused by striking some object with sufficient force to cause the tire fabric to be broken. It need not be a stone that causes the damage.

The break in the fabric may be in only one ply or it may be in all of them : but in any case it is always the inside ply that breaks first.

An inexperienced driver whose tire gets a heavy blow from a stone or a curb usually looks over the outside of the tire to see if any damage has been done. But the old driver knows that if harm has been done the place to look for it is in the inside and that any break in the fabric will be registered on the inside ply first.

Normally the inside ply is shorter than the rest and each ply is shorter than any of the others which are located outside of it. This is because it is on the inside of the curvature of the tire. Now



if the tire is suddenly compressed at some point to a considerable extent, such as shown in the illustration, the relative position of the plies is reversed, that is, the outside ply becomes, at this particular point, the inside ply as regards the curvature and the inside ply becomes the outside ply, as regards curvature.

This has the effect of stretching the inside ply more than any of the others, and, of course, if the amount of stretch is very great, the fabric will be broken.

If it should happen, as it often does, that only one or two inner plies are broken, there will not be any signs of the injury on the outside until a considerable time afterward. This is because the other plies still unbroken will continue to hold against the air pressure even though they will be under excessive strain. But continued flexing will eventually break them also and the result

may be a blow-out which may occur at any time, even on a perfectly smooth pavement.

Another effect of a break in one or two inner plies may be that from continued bending the broken edges of the fabric rub a hole in the inner tube at that point. Sometimes the break is so pronounced, especially in a fabric tire, that the air pressure forces the inner tube into the break, and as this is continually closing and opening, as the tire rolls, the action is like a pair of pinchers and cuts the tube.

If the tube is chafed through or cut after a bruise, such as described, the air will pass directly through the carcass and force the rubber covering, and sometimes the tread, loose from the fabric. When this happens the user generally terms it a blow-out and as a matter of fact it is; but contrary to the opinion often held, it is seldom the result of a defect in manufacture. It can generally be traced to an injury sustained some time prior to the final breaking down of the tire.

Motor Coaches for the Manila Railway

AUTO truck competition has increased to such an alarming rate with the service of the Manila Railway Company, especially in the districts adjacent to Manila, that the railway is being hard pressed to cover expenses. The lack of supervision over auto trucks by the public utility commission makes the competition extremely severe and one which can only be met by reducing the fares or providing more frequent and cheaper transportation. The board of directors of the railway, therefore, recommend the use of motor propelled coaches on designated rail lines. The company has started an auto truck service of its own between Noveleta and San Roque in the province of Cavite with two trucks. From March 1921 when the first truck was placed in operation and May when the second was placed on the run, the two trucks handled 49,170 passengers with receipts of Pesos 9,834 and expenses of Pesos 10,212, which does not include depreciation and interest on the investment. The present fare of 20 centavos is to be increased.

Motor Transport in Malaya

A CORRESPONDENT, writing to *Motor Transport*, points out that considerable expansion is taking place in the motor trade with Malaya, owing to new road construction. A considerable demand exists for motor vehicles, including cars, motor cycles and trucks, although depression in the rubber market has affected purchasers to a certain extent, but the present conditions of the trade are merely temporary, and on the whole are favorable to British suppliers.

Prices, quality, and appearance influence the choice of Eastern motor buyers; but light, serviceable vehicles are the best sellers. With a stablished market, expansion of business will follow. The value of this market to the British motor industry is beyond dispute. The field for enterprise is a British colony, and although United States agents are active, there is a preference for our products. If our manufacturers will study the tastes of the Chinese community, amongst which the readiest purchasers of machines are found, they will compete successfully with the medium priced United States vehicles.

Trucks find a ready sale, and are largely used in Singapore for moving goods, and also for motor 'bus service and they may be seen far out in country districts, shifting marketable produce and conveying passengers, to the increasing exclusion of the primitive bullock carts. The motor 'buses in use are chiefly on 1½ and 2-ton chassis, and regular services are maintained between Kuala Lumpur, Raub and Kuala Lipis in the state of Penang—a distance of 120 miles, chiefly over mountain roads—and they radiate from Kuala Lumpur in all directions, competing with the railways.

Only light cars and trucks are in demand; few 5-ton, and no 10-ton trucks are used in the colony, owing to the character of the roads, and to the fact that light trucks are more economical, their prime cost being less, whilst they are capable of more continuous operation.

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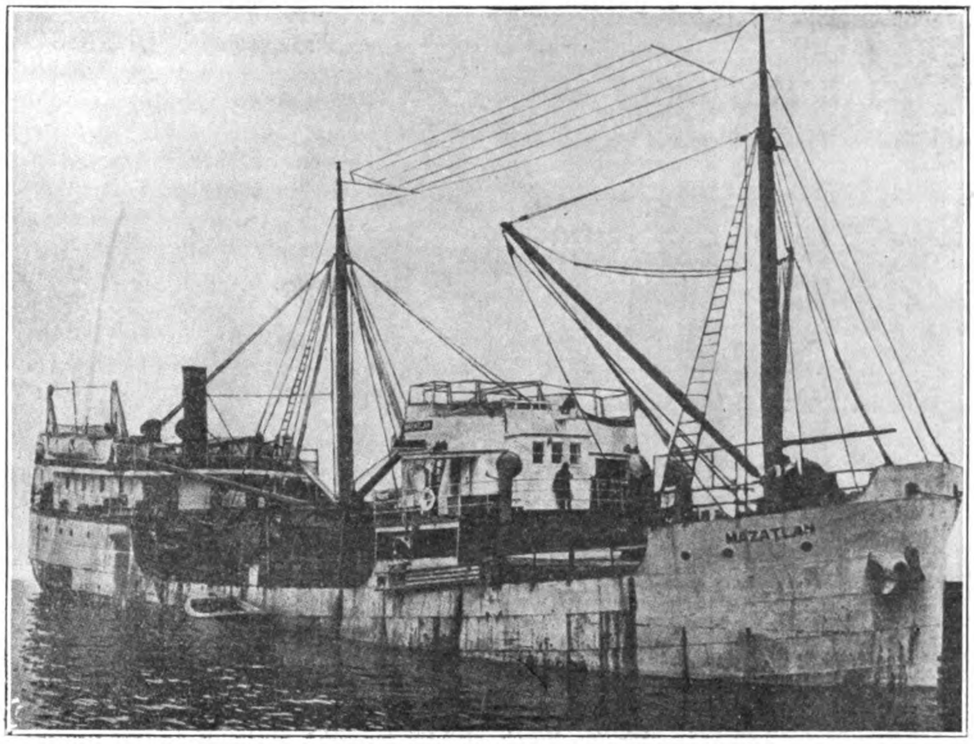
Motor Vessels Developing Siberian Trade

IT is probably not realized generally that the development of the motor vessel is making possible the opening of a vast trade between Puget Sound and Siberia, says Donald Harris in the *Pacific Motor Boat*, but this is nevertheless true. It is probable that without the economical transportation which the motor vessel is able to afford, this great commerce, which is only now in its infancy, would not have been developed.

Motorships are peculiarly adapted to Siberian coast commerce and fur-trading needs. R. S. Pollister of Olaf Swenson & Co., the new Russian-American combine, with headquarters in Seattle, which is behind the development of much of the Siberian trade, states that the cruises of 15,000 to 20,000 miles made by fur-trading vessels during a season, in regions without fuel bases, require the increased cruising radius which the compactness of oil fuel gives and which the steam vessel lacks. Oil engines have been found thoroughly suited to Arctic trips by this company. Motorships are rapidly becoming universal in fur-trading, and will find more and more employment as the rich trade possibilities of the Siberian coast are developed.



The Motorship "Mazatlan," fitted out for Siberian Trading

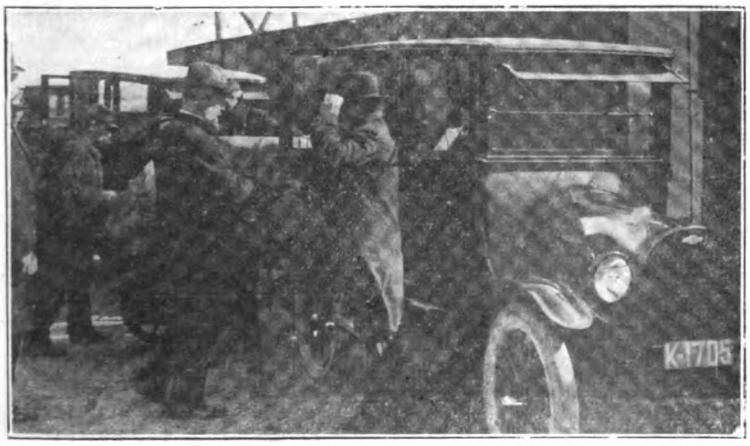
The motorship *Mazatlan*, owned by this company, left April 8th for the Kamchatka peninsula, with a $400,000 cargo of general merchandise to supply the company's numerous stations and to use in trading with independent trappers. She and her smaller sister ship, *Chokotsk*, will cover the entire Kamchatka peninsula, the Okhotsk Sea and the Arctic coast of Siberia.

The *Mazatlan* is 987 tons gross in weight, and carries a 1,500-ton cargo. She is 180 feet long, 37 feet in beam and has a draught of 16½ feet. Fuel oil is carried in her double bottom, her capacity being 1,370 barrels. Her speed is approximately 250 miles a day, and a day's fuel consumption 23 barrels. This will enable her to cover her 15,000 miles in about two months without taking on more fuel. She is powered with two 400 h.p. Winton full Diesel engines, and has two 60 h.p. Fairbanks-Morse auxiliary engines.

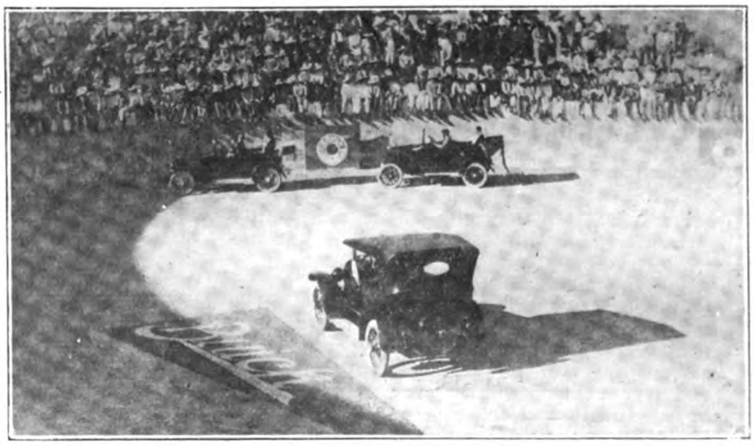
She also carries three 25-foot power tenders equipped with 24 to 30 h.p. Kahlenberg engines. The Siberian coast is so rough that goods usually must be landed through the surf. Moreover, thousands of miles in short side-trips are saved by the use of such tenders. Six other power tenders, ranging from 9 to 25 feet, and with Kahlenberg and Lathrop engines of 20 to 30 h.p. are being taken overseas to sell.

The *Mazatlan's* forward hold is fitted out like a store, so that independent trappers dealt with may come aboard and select goods as they might at a shop. Heretofore, such cargoes have been carried in boxes just as received from factories and wholesalers. Three sides of this hold are lined with huge shelves arranged in compartments in which a great variety of trading goods is arranged for inspection.

The *Chokotsk*, a 110-ton vessel, will be sent out by Olaf Swenson & Co. about the first of May. She will cover the company's northernmost territory, north of Kamchatka, running into the Arctic Ocean as far as the Kolyma River. The purse seiner, *Blue Sea*, will follow her about the middle of May, and will winter in the Kolyma River. Both of these vessels are powered with Fairbanks-Morse engines, the *Chokotsk* with a 140 h.p. engine, and the *Blue Sea* with one of 45 h.p.



Prince Consort Henry of the Netherlands entering a Chevrolet Sedan on his visit to the province of Zeeland. The Prince's visit was made to lay the cornerstone of a monument commemorating the losses suffered through the recent inundations of the district by heavy storms opening the dikes.



A unique motor car advertisement, staged during the procession around the ring that preceded a recent *corrida de toros* at Queretaro, Mexico. A new Buick car on the floor of the arena is the centre of attention.

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

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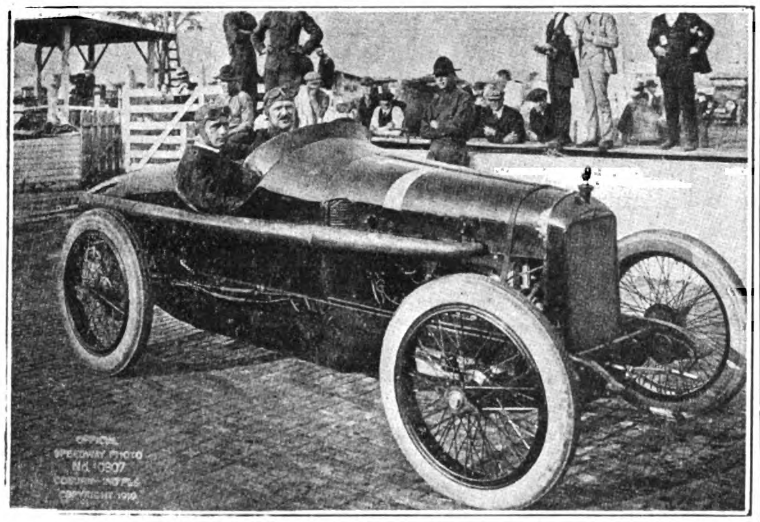
No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



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Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

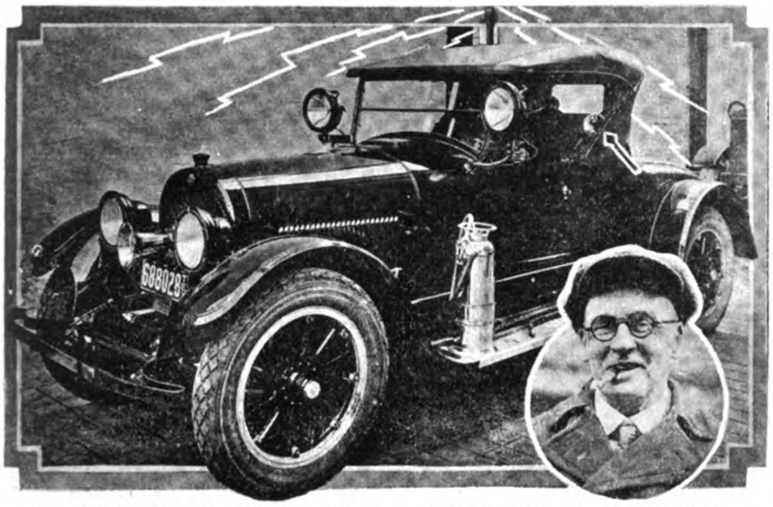
The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

Sold in one, five and ten pound tins. Larger packages if desired.

Fires Soon Mastered with Aid of Cadillac Radio Roadster

FIRE-fighting and fire-signalling equipment seems to have reached the acme of its development, when one considers the huge motor-driven machines, with their loads of ladders and their squads of trained firemen, which plunge down the streets of any large city as soon as the alarm bell sounds from the fire-station tower.

Within the last few months, however, Fire Chief Garrett of Dallas, U.S.A., has developed an entirely new and effective method



Fire Chief Garrett of Dallas, Texas, and his Cadillac Radio Roadster

of keeping in touch with incipient blazes, that bids fair to be adopted by fire chiefs of other cities as well.

This scheme of Chief Garrett's is embodied in the Cadillac radio roadster—a standard Cadillac type 61 car equipped with wireless telephone attachment, in which the Dallas fire chief travels about the city.

A short time ago it was visibly brought home to a Dallas observer how Chief Garrett, by means of his radio roadster, could keep closely in touch at all times with fires and their location.

The red Cadillac roadster, with its big headlights, its wireless mast and Babcock fire extinguishers, was seen moderately jogging down one of the main streets of Dallas. All at once the car was seen to come to an immediate stop—the gears were thrown into reverse and it swerved about. Then with a strident yowl from its big warning signal, it dashed away in the opposite direction.

Within another minute the sound of a fire alarm, tapping out on the central station bell, was heard.

Chief Garrett had received the information of the fire and the location of the alarm before the machinery which set the bell to tapping could be put into operation.

The receiving apparatus of the Cadillac radio roadster is neatly and compactly tucked away in a black box behind the driver's seat, and the wireless messages are sounded from a horn close by the driver's ear.

Chief Garrett is very modest in describing the successful operation of his fire-detecting mechanism. He says:

"There isn't much to that; its simple. All you do is tune up and the man at the central office just talks into the transmitter, and it comes out through this horn. It isn't any trouble to hear what he says."

The Rarity of Air Travel Accidents

BRITISH publications, from all indications, are certainly behind aviation and are doing their utmost to encourage the industry. The recent collision of two air expresses on the London to Paris airway which resulted in the loss of six lives, has occasioned editorial comment on the part of several publications wherein the comparatively few airplane accidents in relation to the considerable number of flights made was pointed out.

The *Illustrated London News*, in this connection, devotes an entire page in its issue of April 22nd, to a graphic chart showing the extent to which commercial aviation was operated between different countries in Europe during the years 1920 and 1921. From this chart the following pertinent data is gleaned :—

	Continental Flights			
	Number of Flights		Passengers Carried	
	1920	1921	1920	1921
British machines	2,854	993	5,799	5,256
French machines	657	1,565	486	4,352
Belgian machines	104	421	98	630
Dutch machines..	5	366	0	480
By others	0		0	13
Grand total of flights and passengers carried to and from England	3,620	3,345	6,383	10,731

Goods transported by air—1920—imported total values £677,-047, exported total values £351,765; 1921—imported £375,474, exported £195,826 (Britain).

Accidents in British civil aviation (including continental routes :—

Year 1920—out of 42,296 passengers (mileage 546,400m.) 14 killed, 15 injured.

Year 1921—out of 42,680 passengers (mileage 452,000m.) 3 killed, 6 injured.

The totals of British civil aviation flights are (for 1920) 26,803 flights, (for 1921) 23,152.

It will be noted from the above that there was a decided falling off in the number of flights made in British machines during 1921 as compared with the preceding year, though in the matter of passengers carried the disparity is not so great, the number in 1921 being 543 less than that in 1920. To offset this, however, a considerable increase in flights and passengers carried by French, Belgian and Dutch machines is shown for 1921 as compared with the 1920 figures. Of much significance are the statistics on accidents, for although the number of passengers taking flights in airplanes during 1921 exceeded the number carried during 1920, only 3 were killed and 6 injured during 1921 as against 14 killed and 15 injured in 1920, indicating that great strides have been made in the matter of making the airplane a safe means of rapid transportation.

A scene in the mountain-crests of Chile, at the tremendous height of 15,500 feet—nearly three miles above sea level. The car shown is an Oakland. It operates regularly in the highly-rarified mountain atmosphere, being used by the Pederosa Mining Co., Ltd., who describe it as "a powerful and wonderful car"

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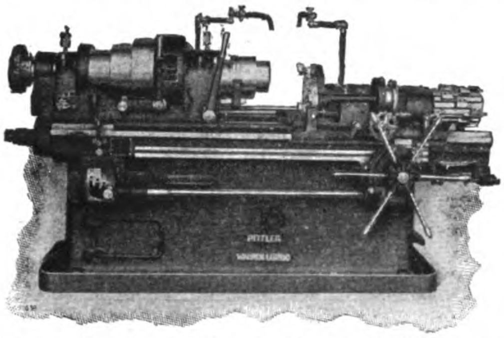

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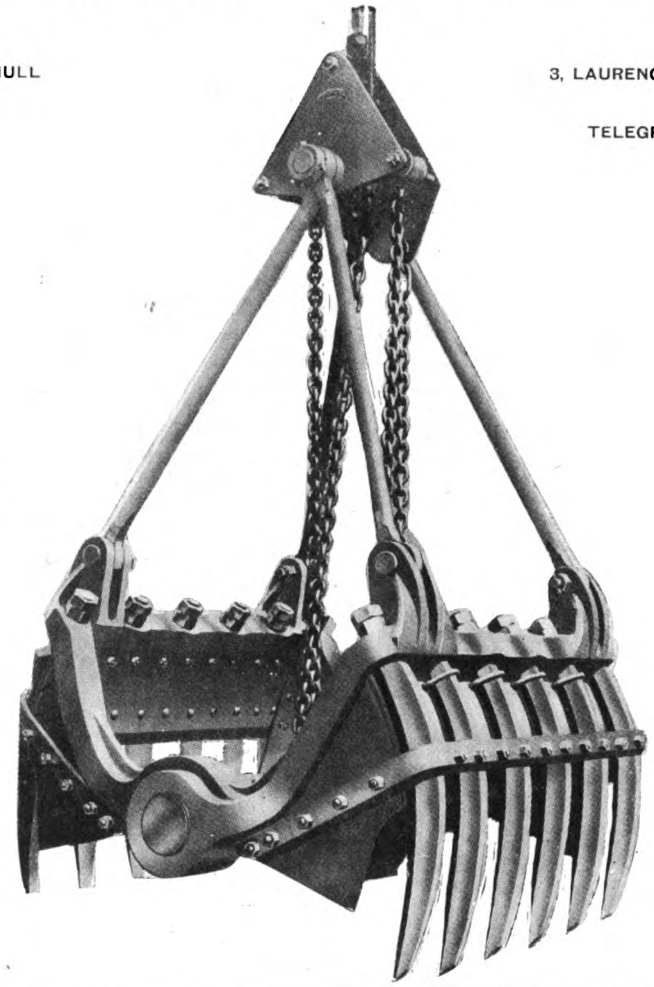

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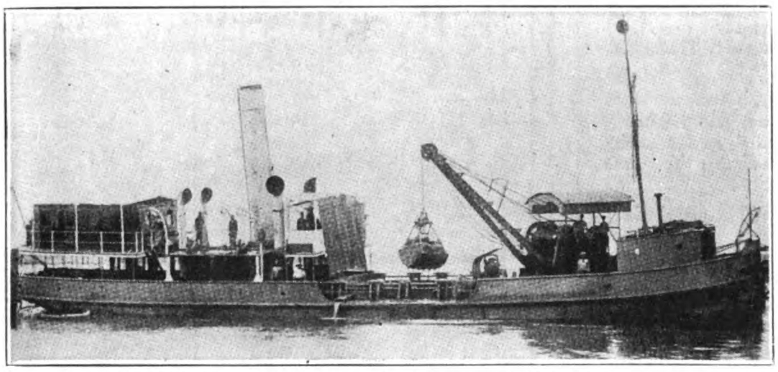
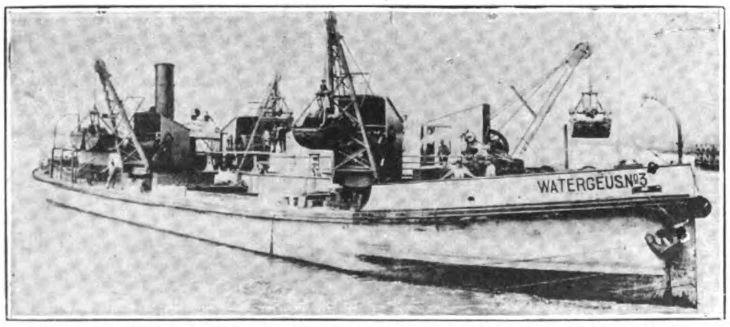


One of 38 Grab Dredgers Supplied for the British Government



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Vol. XVIII AUGUST, 1922 No. 8

A. L. TAYLER

SHANGHAI, PEKING, TOKYO AND MANILA

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Practically back to Pre-War Prices

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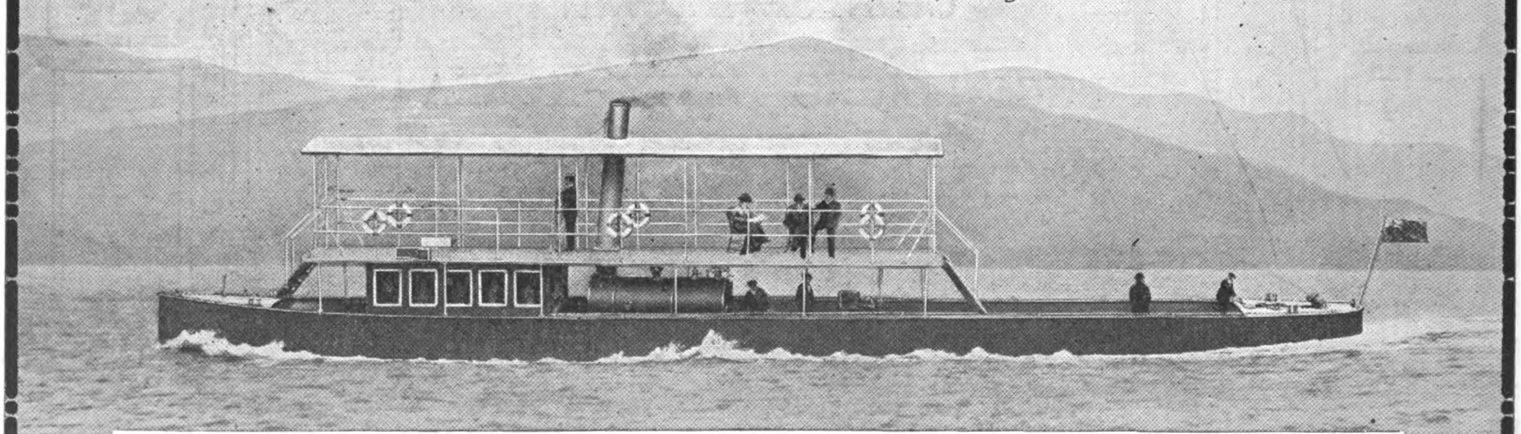

Length, 160-ft.; Beam, 24-ft. 6-in.; Draft, carrying 40 tons 2-ft. 3-in.; Speed, carrying 40 tons 15 Statute miles an hour, burning wood fuel only

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SUMITOMO

A Prince of Industry

IT is difficult for the modern captain of industry to hide his light under the proverbial bushel. The press will eventually find him, pry out the story of how he did it and hold him up as a model for the rising generation to emulate. The story of America's millionaires has been told and retold. The successful British businessman rarely makes a fuss about these things. They are all in the day's work. But for shrinking modesty about industrial success one has to come to Japan to find a group of conservative, retiring and reticent captains of industry whose enterprises are part of the story of Japan's advance and whose beginnings are lost in the dim pages of past history. Their phenomenal rise in the past two decades equals, if not surpasses, many of the more widely known western names whose success is chronicled as part of modern history. It is only through official reports, the occasional stories that appear in some Japanese publication and by visiting the country that one gathers an idea of the full extent of the operations of such concerns. The Japanese captain of industry is not talkative. He avoids interviews. In fact, when it comes to publicity about himself, he has nothing to say. The barrier of language keeps his fame within the boundaries of his own country.

Back in the closing years of the seventeenth century, when America was still the Thirteen Colonies and England was about to establish a national banking institution, a copper mine was discovered along the shores of the Inland Sea of Japan and was opened and worked by the lucky discoverer. So was born the house of Sumitomo, a name to conjure with in present-day Japan. From this beginning 232 years ago, there has grown one of the most important enterprises of the world, which to-day operates with a total capital of nearly Yen 250,000,000 and controls copper, gold, silver, coal and iron mines, smelters, refineries, tube, wire and nail factories, fertilizer and lumbering enterprises, warehouses, steel works and a bank with Yen 70,000,000 capital having branches in all the principal cities of Japan and the Far East, as well as in London, New York, Bombay, San Francisco, Honolulu and Seattle. Where goes the trade of Japan, goes the house of Sumitomo. In a recent speech at Tokyo, Secretary of the Navy Denby described the bushido of old Japan as the "Way of the Gentleman." The house of Sumitomo lives up to this definition of the chivalry of Nippon and wherever it goes throughout the world, it carries with it the bushido of business, a guarantee that the highest and best traditions of Japan still live in the present-day struggle for trade.

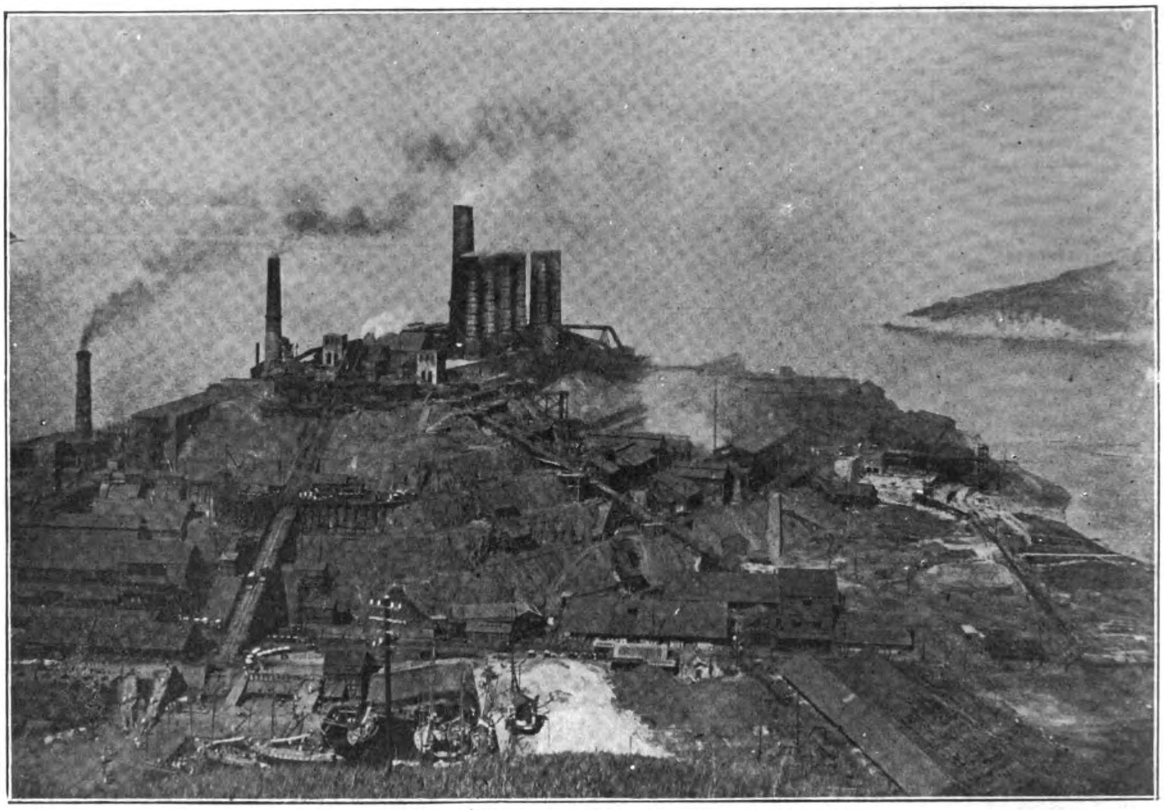
For nearly two centuries the firm of Sumitomo confined its activities largely to the development of its mining interests, carrying on the work with unwearied research and scrupulous adherance to a code of business ethics which won for its products the highest place in the copper markets of Japan and as time passed, in the outside world. With the growth of the mining business and the accumulation of profits, the house of Sumitomo branched out into banking, advancing large sums to the Daimyos under the Shogunate and the merchants of the city of Osaka, which was then gaining its prominent position as the centre of commerial and industrial Japan. The Osaka of to-day, that great smoking behive of Asiatic industry, was made possible, in part, through the civic pride of the Sumitomo firm which for over two centuries has maintained its head office there and identified itself with its growth and prosperity.

With an output of 1,497 tons in 1698, the Besshi Copper Mine on the Inland Sea of Japan took its place as one of the world's great producers, a place it has held until now it is treating 233,000 tons of ore and producing some 3,000 tons of refined and 11,230 tons of electrolytic copper, with every indication that it will continue to produce indefinitely without any alteration in quality. Shortly after the restoration, the Sumitomo firm opened a special office at Kobe for the export of its copper products, and with the progress of Japan and the expansion of the firm's activities, the selling organization has now its own offices in all the leading cities of Asia, and several in Europe and America.

In 1894, the firm bought out a copper rolling concern in Osaka and under the name of the Sumitomo Copper Works started to manufacture copper rods, plates, tubes and wires from the output of the Besshi mine. Three years later, a branch factory was established at Nakanoshima for the manufacture of zinc plates, rods and aluminium plates and wires. In November, 1895, the manufacture of insulated wires and electric cables was commenced, and in November of the following year solid and drawn tubes were successfully turned out. Later a plant was erected to make large copper sheets, and a branch factory erected at Amagasaki for the manufacture of wire nails, and galvanized wire. Constant improvements and the installation of the most modern equipment has maintained these plants at a high state of efficiency. The quality of the products has steadily advanced, being specified and approved for use in all Japanese government work, especially for the navy.

In 1894, the firm acquired coal properties in Kyushu producing excellent coking coal from the Tadakuma mine and from the Kiuragi mine some of the best steaming coal in Japan. The output of the two mines, which during the war reached 500,000 tons is now about 300,000 tons. In 1901, the firm entered upon one of its most important enterprises by purchasing the plant of the Nippon Steel Works located in Osaka, launching out as the first private steel works in Japan. These works have a melting capacity of 40,000 tons of acid and basic steel, which is converted into wheels, axles, rollers, shafting, cylinders, gear wheels, ship and engine parts. Its products are approved not only by the Japanese government but by Lloyd's for their A1 specifications.

In 1911, the wire and cable factory of the firm was made independent of the copper works under the name of the Sumitomo Electric Wire and Cable Works, which is now capitalized at Y.12,-000,000 and is producing all kinds of electric wires, insulated and armoured cables and other conductors. In addition, a fertilizer factory was established in 1913 near the Besshi Copper Mine, where the ores are treated for their sulphur content, producing sulphate, nitrate and super-phosphates and compound fertilizers which are sold direct to the farmers through the firm's own representatives in each prefecture.



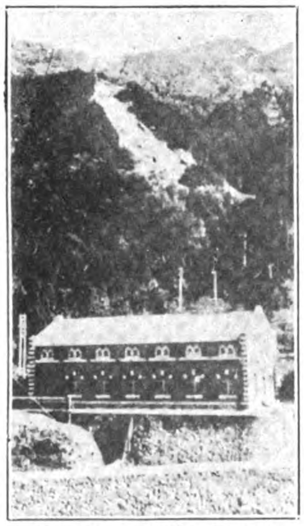
Sumitomo Besshi Copper Mine: Shisakajima Smelter

In addition to the copper and coal mines, the firm has developed gold and silver mines in the Hokkaido and it is expected that the proverbial luck of the Sumitomos will hold good and these will also enjoy as wide a reputation as the copper properties.

At the head of these prosperous enterprises stands the energetic descendent of a long line of noble ancestors, Baron Kichizayemon Sumitomo, the younger brother of Prince Tokudaiji (ex-lord chancellor to the late Emperor) and of Marquis Saionji, the last of the elder statesmen. He was adopted into the Sumitomo family in 1892 when twenty-eight years of age. In 1897 he set out on a tour of Europe and America. It was not the usual tour of the pleasure-seeking nobleman of other countries. His days were spent in visiting factories and mines, studying their organization, ways of conducting business and especially the methods for the promotion of the welfare and happiness of the workers. He was equipping himself for the huge task that some day he would be called upon to shoulder in directing the affairs of his house. Rarely indeed, is the picture presented of the descendent of a long line of princes surrendering the ease of aristocratic surroundings and court life to enter the turmoil of business in order that he might better serve his nation and advance the well-being of his dependents. Soon after his return from this tour, he was elected to the house of peers, but resigned in order to apply himself more closely to the development of the interests entrusted to his care. In 1911, he was created a baron in recognition of his services to the nation in advancing its industries. Since then he has devoted himself entirely to the management of the vast interests of the family he cast his fortunes with.

The solicitude shown for the welfare of the employees by the head of the house is reciprocated by an intense loyalty that cannot be duplicated in any similar enterprise in the world.

The control of the vast Sumitomo enterprises is centred in a *honten* or head office under the name of the Sumitomo Goshi Kaisha, a limited partnership at the head of which stands Baron Sumitomo. For the management of the firm's enterprises there is a board of seven directors and three managers who direct the affairs of the various enterprises and account to their head for all affairs of importance and see that his policy and instructions are rigidly adhered to. This central board is composed of the actual heads of the subsidiary companies. Its present composition will indicate the close working of the organization. The president is the head of the house, Baron Sumitomo. The directors are Masaya Suzuki (head director) who acts as general manager for the Sumitomo family. Here we have a high type of Japan's executives, an experienced lawyer who resigned from the government service to accept the management of the Besshi Copper Mine, and is now chairman of the board of the Sumitomo Electric Wire and Cable Works and of the Sumitomo Steel Works and a director of the Sumitomo Bank. Mr. Kwankichi Yukawa, president of the Sumitomo Bank, is undoubtedly one of the strongest characters on the central board, recognized as one of the most brilliant financiers of the empire. Mr. Chojiro Kusaka is manager of the extensive warehouse system of the firm; Mr. K. Ohdaira is the general manager of the Besshi Copper Mine and Mr. Junkichi Matsumoto is general manager of the Sumitomo Copper Works. In addition, there is Mr. Tadateru Sumitomo, a member of the family and Mr. Masatsune Ogura. The actual management of the head office is entrusted to three managers, Mr. M. Ogura, Mr. K. Honjo (who also directs the forestry and lumbering interests of the firm) and Mr. Naoji Hidaka.



3,000 kw. Hydro-Electric Plant Supplying Power to the Besshi Copper Mine

Fourth Adit, Besshi Copper Mine

Each department of the various enterprises has its own executive who reports to his special director on the central board.

The old policy of the firm was one of self-centralization and conservatism which limited its scope of operations to Japan and its foreign business to copper ingots. Under the new policy inaugurated about a decade ago, and under the guidance of the new central board, it began to expand and keep in touch with world movements. To-day, the Sumitomo activities cover the world.

Under the control of the central board of directors of the Sumitomo Goshi Kaisha are the following companies:—

The Sumitomo Besshi Copper Mining Office; The Sumitomo Wakamatsu Coal Department; The Sumitomo Fertilizer Factory; The Sumitomo Copper Works; The Sumitomo Warehouses; The Sumitomo Forestry Department. In addition, there are the following subsidiary companies:—The Sumitomo Electric Wire and Cable Works, Ltd., capitalized at Yen 10,000,000; The Sumitomo Bank,

Ltd., capitalized at Y.70,000,000 and the Sumitomo Steel Works, Ltd., capitalized at Y.12,000,000. The capital of the Sumitomo Goshi Kaisha is placed at Y.150,000,000 and with the subsidiaries this makes a total of Y.242,000,000.

We give herewith a brief description of the various enterprises mentioned above.

Sumitomo Besshi Copper Mining Office

NIIHAMA, IYO

Mr. Komadzuchi Ohdaira, *General Manager.*
Mr. Unosuke Okada, *Manager.*

The Mt. Besshi concession covers over an area of some 7,000 acres, at 3,000 to 4,000 feet above sea-level, 12½ miles distant from the northern shore of Shikoku island. From its discovery, two hundred and thirty years ago, the output has been as follows:

Period	Years	Refined Copper, produced. Eng. ton.
1691—1867	177	43,508
1868—1877	10	12,933
1878—1887	10	25,454
1888—1897	10	48,094
1898—1907	10	49,216
1908—1917	10	78,600
Total 1691—1917	227	257,805

The annual output of ore is now about 233,000 tons, producing 3,000 tons of refined and 11,230 tons of electrolytic copper. When its output was about 1,499 tons in 1698, this mine must have been the foremost on earth. In the middle of the 19th century, the output began to fall, but with the installation of improved and better European methods for mining, transportation and metallurgical treatment, a steady increase has been maintained.

The Sumitomo's refined copper, or "K.S. Ingot of Japan," has very few metallic impurities. The Besshi refined copper contains 99.7 per cent. and the electrolytic 99.9 per cent. copper. It is of an exceedingly beautiful rose color and specially suitable for the manufacture of brass. It is sold at figures above the "B.S." brand on London market.

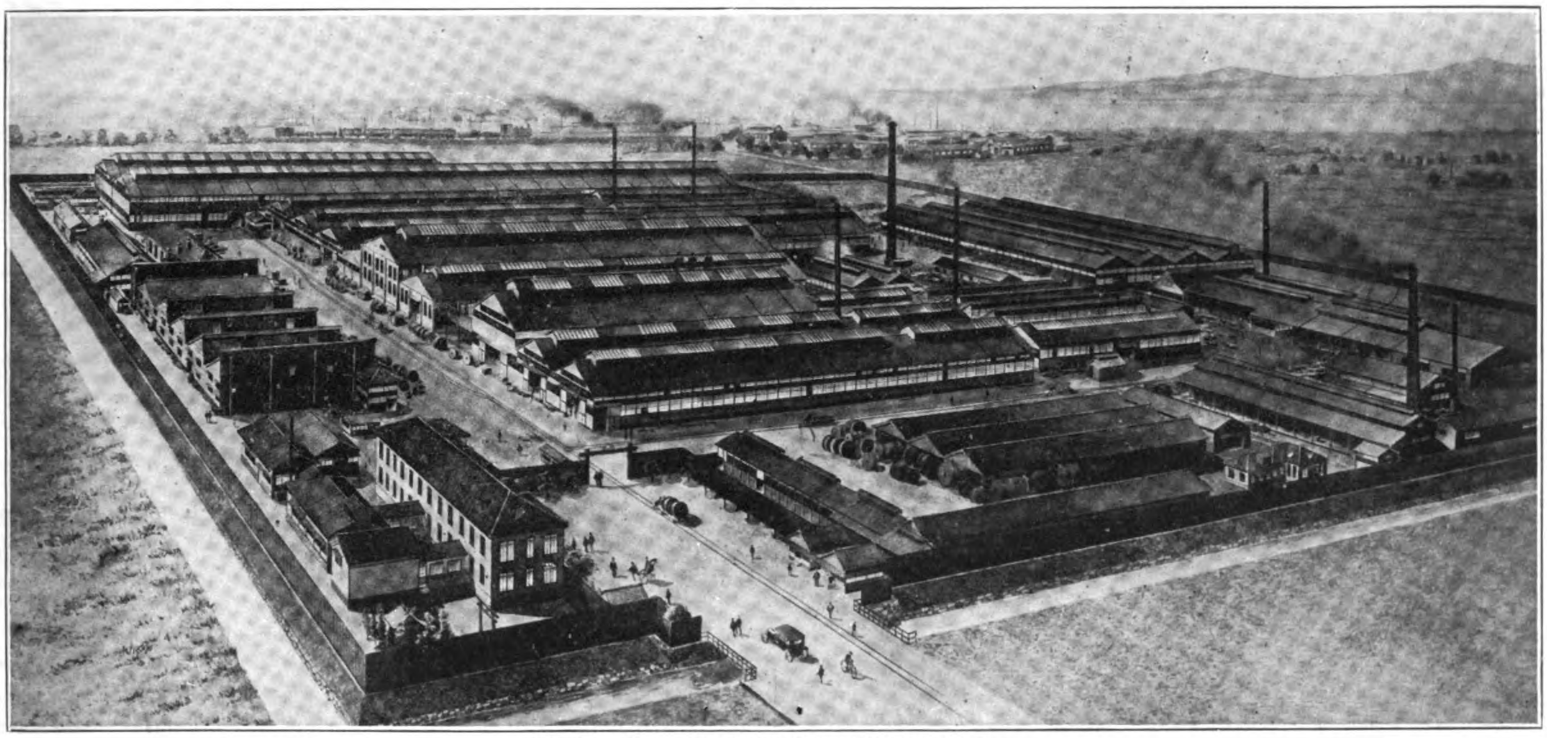
GEOLOGY.—The geological formation of the Besshi Mine is crystalline schist consisting of quartz-sericites and chlorite, between which lies the ore deposit, 5,000 feet long and 2 to 25 feet thick outcropping at the height of 4,000 feet above sea-level. The present working point is 3,000 feet, at the deepest, below the outcrop. The ores are cupriferous iron pyrites, with an average 3 per cent. of copper.

MINING.—An inclined shaft is sunk 1,782 feet along the dip of the ore deposit starting at the outcrop and having cross-cuts at every 260 feet with 8 levels. The shaft was sunk under the superintendence of M. Raloque, a French engineer, then in the service of the firm. There are two adits called "first" and "third" adits and a fourth 12 feet wide and 15,000 feet long and a blind vertical shaft, connecting the third and the fourth adit, 17 feet in diameter and 1,950 feet in depth.

Ores are excavated by overhand stopping, hand-borers and hand-drills from the Pneumatic Company of Chicago and rock-drills of the Schramm and Walter Leyner type, and one improved by Dr. H. Kudo, mechanical engineer of the firm, are used.

DRESSING.—The crude ores are carried out of the mine to Tonaru on electric trolleys, where they are screened, crushed and picked according to the copper content. The dressing plant is on the sea-ward side of Mt. Besshi, and has a capacity of 1,000 tons a day.

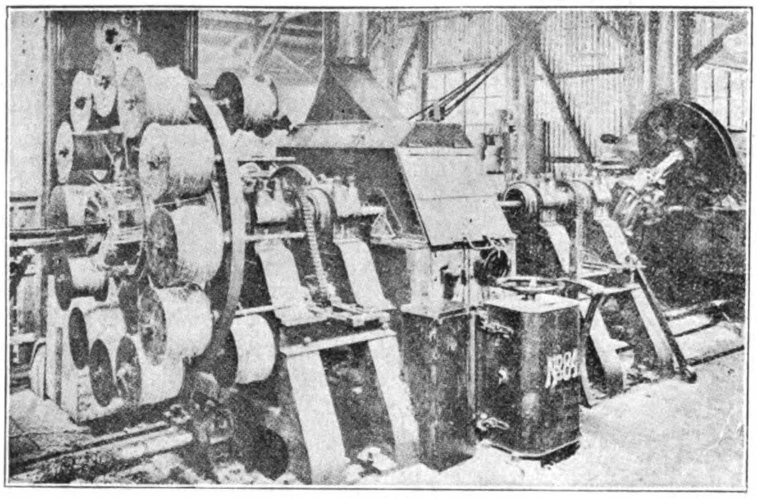
CEMENTATION.—Lest the mine-water charged with sulphuric acid, sulphate of copper and iron and other ingredients should damage the farms in the neighborhood, it is treated in cementation plants and then run direct to the sea by a drain, 10 miles long and 1½ feet square which is specially constructed for the purpose. A large tower-system cementation plant is now building.



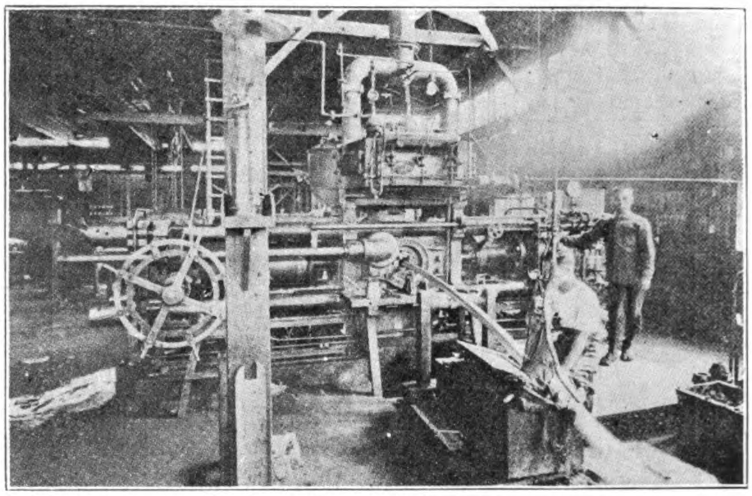
The Sumitomo Electric Wire and Cable Works

METALLURGY.—The sorted ores are sent down to Niihama, where the main office for the mine stands, by aerial tramway and light railway. Between Niihama and Shisakajima island (9½ miles) a fleet of ore-boats ply daily carrying an aggregate of 400,000 long tons of ore in a year. On the island there is a modern smelter and a process of pyrite-smelting is in use. For fine ore and flue dust the most perfect pot-roasting plant is arranged. As the smelter is on an island more than nine miles distant on all sides from the farms, the fumes do not interfere with vegetation. A cable connects the island with Niihama. The matte from the blast-furnace is converted into crude copper by a Bessemer converter and "Atebuki," an improved method of the old "Mabuki" process. The refined copper is moulded into ingots known as the "K.S. Ingot of Japan."

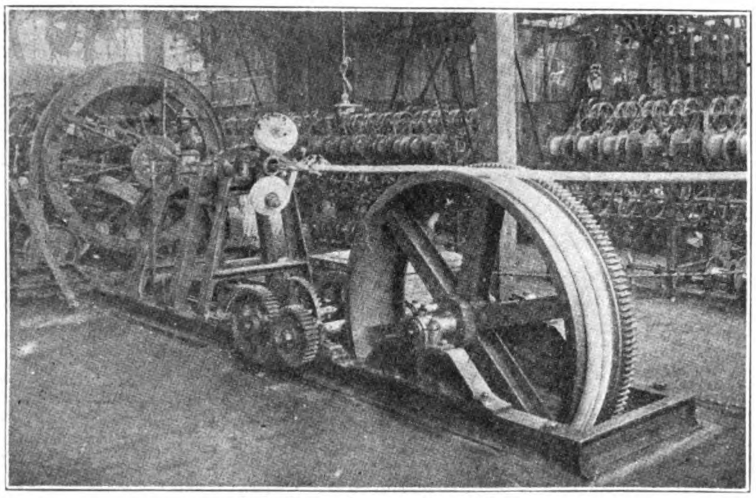
SUMITOMO ELECTRIC WIRE AND CABLE WORKS



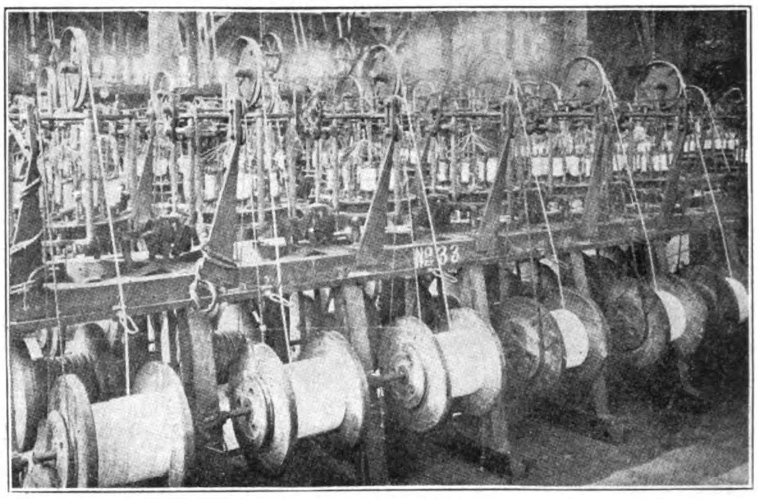
Armouring Machine



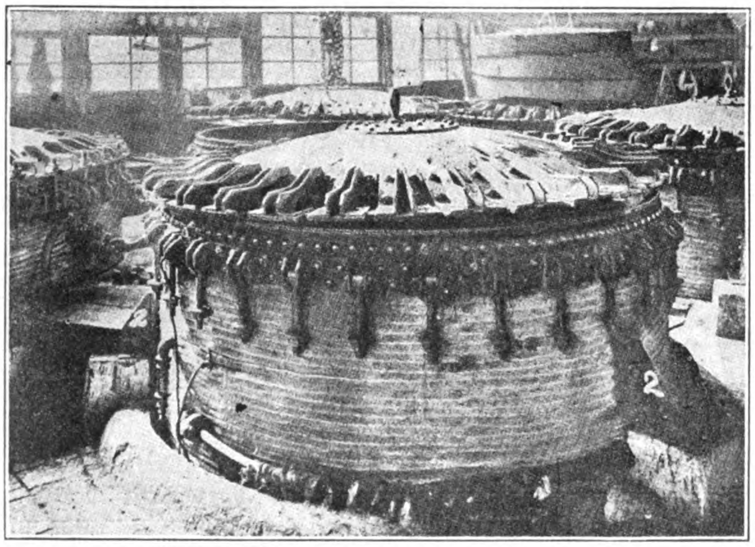
Lead Sheathing Machine



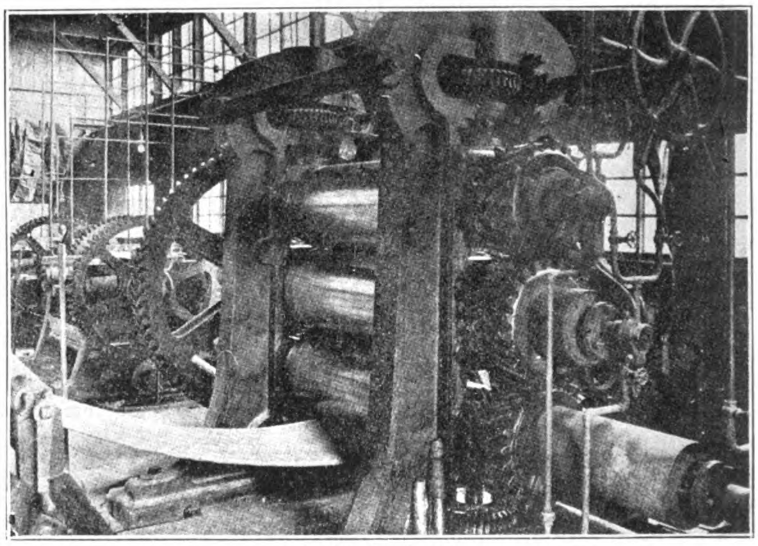
Telephone Laying Machines



Braiding Machines



Vacuum Tanks

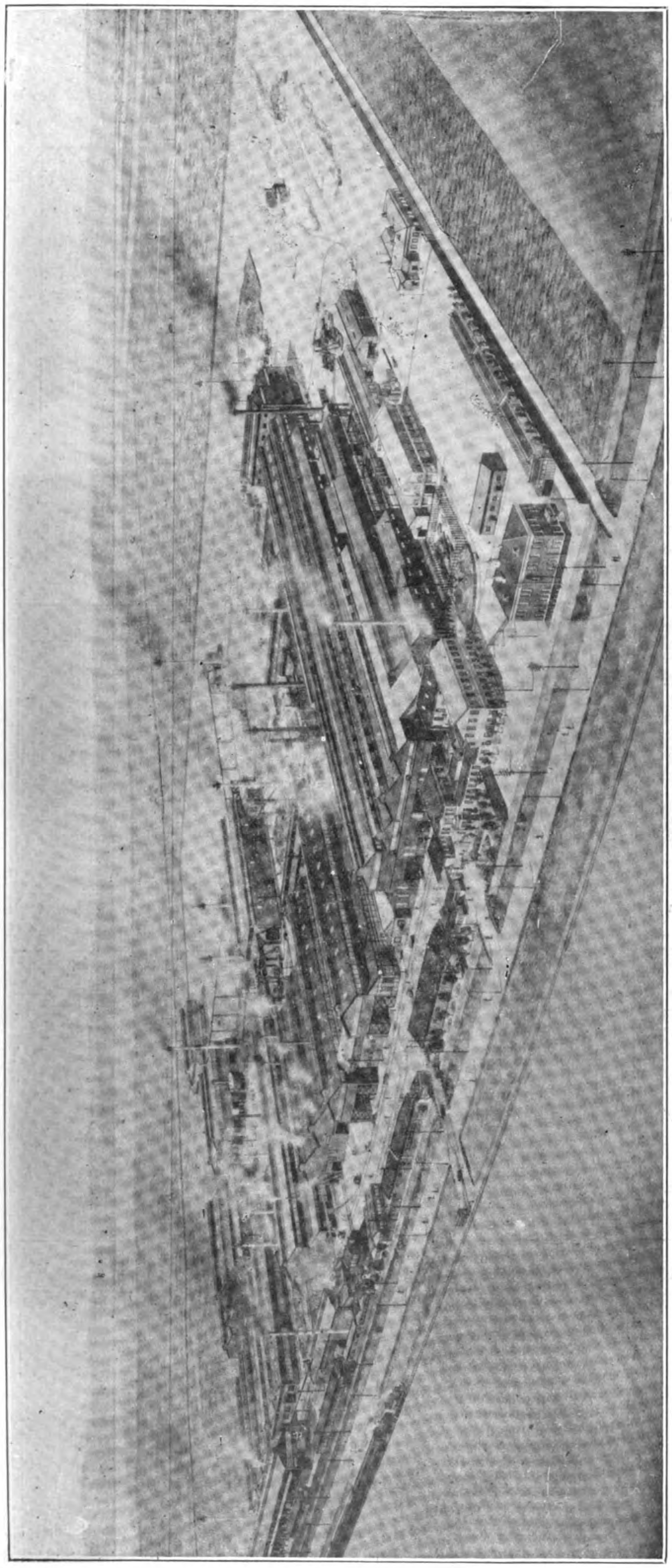


Calender Rolls

Motive Power and Transportation.—The motive power for the mining operations is derived from a 3,000 kw. hydro-electric plant. The water is led from Hiura on the eastern side of Mt. Besshi through an adit into the mine and along the third adit to Tonaru and then to Ishigasanjo, on the opposite side of the mountain. The fall is 1,969 feet with a volume of about 25 cubic feet per second. The power for metallurgical operations is generated by steam.

For ore and provision transport between Niihama and Tonaru, there is a light railway of six miles running from Niihama to Hateba and an aerial tramway of 12,276 feet which connects Tonaru and Kuroishi. For ore conveyance to Shisakajima, there is one tugboat and twenty-four sailing vessels plying daily. For copper ingots, passengers and general freight, the firm owns three steamers in daily service between Osaka and Niihama touching at Kobe, Onomichi and other places. For communicating among the many offices, a private telephone system with 247 'phones is provided.

Accessory Enterprises.—As regards accessory enterprises in which the Sumitomo Besshi mining office is engaged, mention



The Sumitomo Steel Works

may be made of the manufacture of coke used by the Shisakajima smelter and other works of the firm. Besides, they have mechanical shops for making and repairing mining tools. Meteorological stations are erected at all places of importance. Forestry goes hand in hand with the mining industry and the Sumitomo is pushing this work with vigor in the mining districts. It owns 30,000 acres and holds 50,000 acres on lease from the government for this purpose.

WELFARE OF EMPLOYEES.—There are about 5,200 men on the pay-roll, 3,700 men in the mining department and 1,500 in the metallurgical. The promotion of their welfare has long been the care of the executives of the firm. At Niihama, a hospital has been established with branches at Tonaru, Shisakajima and two other places and medical aid provided free in case of accidents. Free primary schools are maintained for boys and girls of all the employees. Amusements and recreations are provided; theatrical and other entertainments are given from time to time. Houses are built and let to employees at a moderate rent. Daily necessaries are supplied at a very cheap price by the stores conducted under the firm's supervision.

Sumitomo Wakamatsu Coal Department

WAKAMATSU, CHIKUZEN, KIUSHU

Mr. Yoshiharu Yoshida, *General Manager.*

Through this department of the firm, coal from the Tadakuma Mine is disposed of. The concession includes the Kiuragi Mine of 1,000 acres and the Ohse Mine of 1,700 acres. The total area of the concession is 40,000 acres, of which 4,500 are being worked and the balance held for development. It yields black and bituminous coal of high heating value. The coal is very suitable for making coke. The output is as follows:

1911	322,000 tons
1912	376,000 ,,
1913	384,000 ,,
1914	374,000 ,,
1915	352,900 ,,
1916	331,000 ,,
1917	324,000 ,,
1918	263,000 ,,
1921 (about)..	300,000 ,,

The Tadakuma colliery is worked by two inclines, one 2,256 feet in length with an inclination of 20° and the other 5,304 feet long inclined at 14°. The coal is conveyed to the screening plants by an endless rope-system. Within the mine, everything in the way of modern appliances is employed for the sake of economy in labor and the welfare of the workmen. For the driving of turbine pumps and sinking shafts, an electric power plant of 400 kw. is installed. Transportation facilities are all that could be desired; the Chikuho branch line of the Imperial Japanese Railways passes near the colliery. Over 3,000 men are employed.

Sumitomo Warehouse

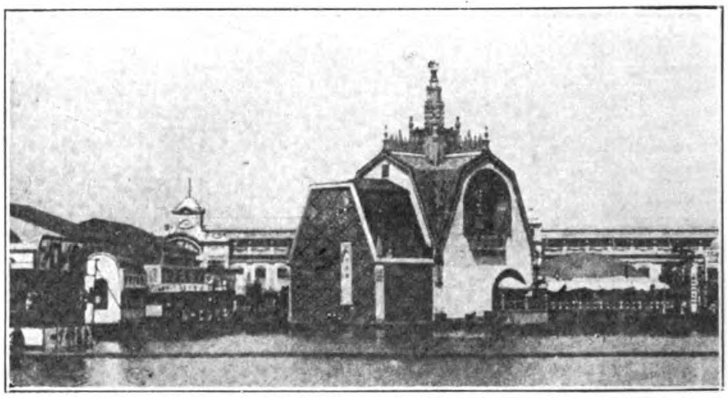
NAKANOSHIMA, OSAKA

Mr. Chojiro Kusaka, *Manager*

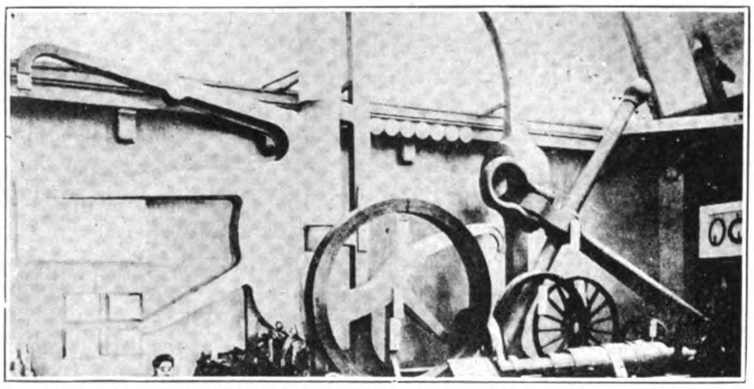
The Sumitomo warehouses were originally established for the purpose of storing goods taken by the Sumitomo Bank on mortgage. They were made independent of the Bank in 1899 and organized into a separate department to carry on a general warehousing business.

THE SUMITOMO EXHIBIT AT THE PEACE EXPOSITION, UYENO PARK, TOKYO

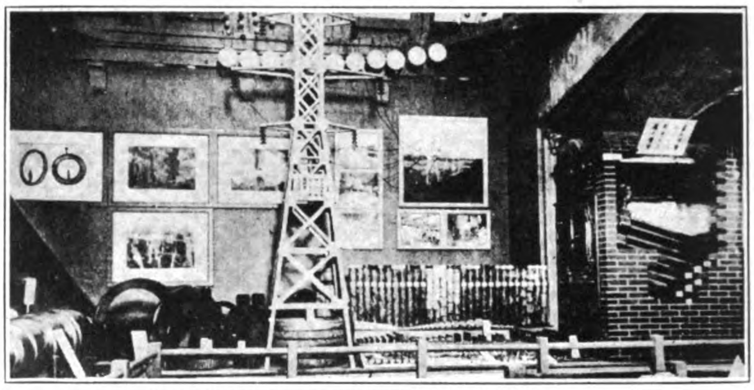
Visit of the Crown Prince to Uyeno. Entering the Sumitomo Palace



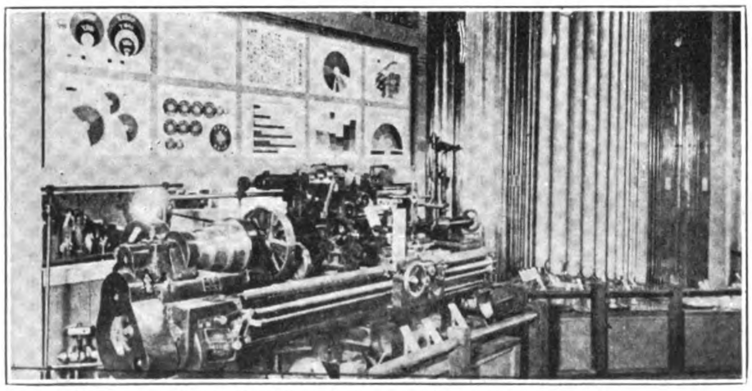
The Magnificent Gothic Edifice housing the Sumitomo Exhibits



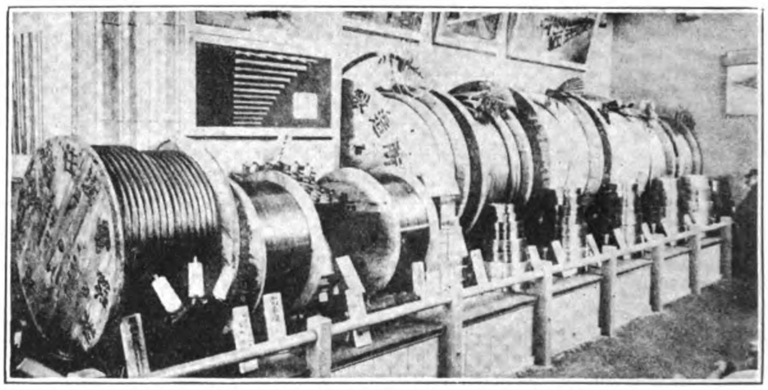
Products of the Sumitomo Steel Works. Rudder Frames, Piston Rings, Anchors, Shafting, Guns, etc.



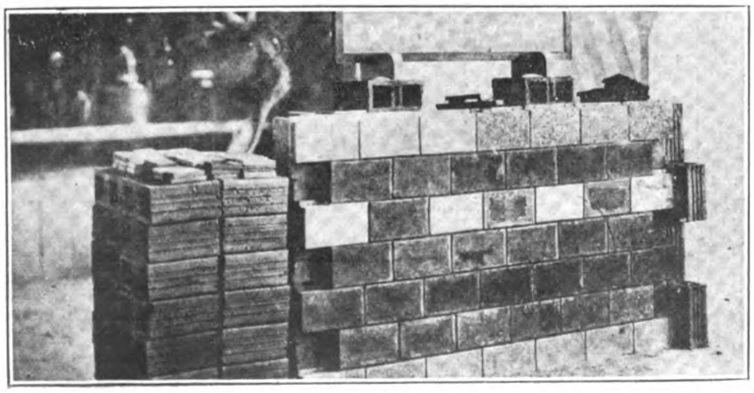
Steel Transmission Towers, Boiler Tubes, etc.



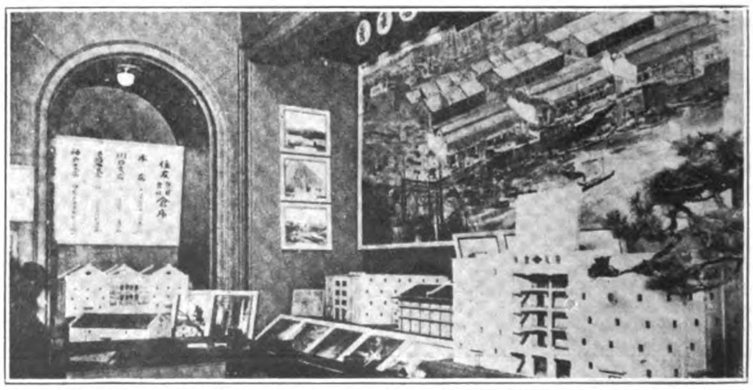
Precision Tools, Lathes, Copper and Brass Rods, Tubes, etc.



Copper Wire, Insulated and Armoured Cables, etc.



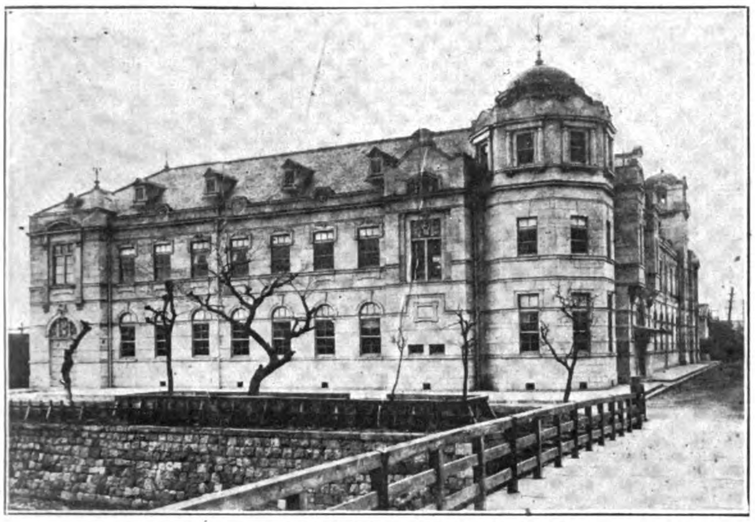
Hollow Tiles



Warehouse Exhibit, showing models of new Warehouses under Construction in Osaka

All warehouses are first-class brick of fireproof concrete buildings, safely and conveniently situated. The business enjoys unparalleled prestige,

Its Kobe and Kawaguchi branches are largely given up to bonded and private warehouses for the Kobe and Osaka customs houses. It has recently established its own warehouses near the



Sumitomo Head Office and Bank, Osaka

Osaka harbor pier in order to facilitate storing or re-packing imported and exported goods. The stocks in warehouses at the end of May 1922, were valued at Y.80,430,930.

The branch warehouses are: (1) Kawaguchi branch in Kita-ku Osaka; (2) Dotombori branch, Nishi-Ku, Osaka; Kobe branch and the Tokyo branch.

Sumitomo Copper Works

AJIKAWA, OSAKA

Mr. J. Matsumoto, *General Manager.*
Mr. I. Fujimoto, *Manager.*

The Works, established in 1897, covers 13.61 acres, 6.66 acres of which is occupied with sheds and shops and employs 3,700 hands.

The Works are divided into six departments :—

(1) Foundries; (2) Sheet and Plate Mill; (3) Tube Mill; (4) Bar Mill; (5) Steel Tube Mill; (6) Testing Department.

1. FOUNDRIES.—The foundries supply the shops with various ingots. Long experience on the part of the skilled staff enable the Works to depend on reliable materials for its products.

2. SHEET AND PLATE MILL.—The Mill turns out sheets and plates of copper, zinc, brass, yellow metal, naval brass, manganese bronze, phosphor bronze, aluminium, German-silver and many other metals. It has an up-to-date and improved mechanical equipment which is laid out on such a scheme and plan as to ensure economy in working. It produces all kinds and sizes of sheet and plate for all purposes furnished in hot or cold rolling process. Heavier plates for locomotive and marine engines are also rolled.

3. TUBE MILL.—The Mill is the pride of the Works. Its manufacturing facilities are not only of dimensions that have no rival in Japan but rank among the best mills of the world. Refinements of technique have been achieved; intricacies in engineering have been mastered; and a special process has been invented and installed with no small success. The seamless tubes there made are light in weight and are strong against breakage. The copper, and condenser tubes are approved by the imperial Japanese navy.

4. BAR MILL.—The Mill is well furnished for the production of bars, rods and other metal of various forms and shapes to order. They are finished exact to required size and shape with a perfectly smooth surface free from cracks, spills or any other defects.

Blading materials for steam turbines were produced at the Works' mill for the first time in Japan about six years ago. Since that date, with much effort and endeavor the Mill has succeeded in originating and adopted a special process of production which has enhanced its business.

5. STEEL TUBE MILL.—For seamless tubes, the Mill is equipped with its own process of manufacturing, by which means steel bloom is first pierced, rolled and drawn to the length and diameter required. The tubes are finished into a uniform thickness, and perfectly smooth both inside and outside throughout the whole length. The consequent absence of longitudinal seams makes the tubes very strong and durable. They are supplied to the Imperial Japanese navy, railways and private shipyards.

6. TESTING DEPARTMENT.—To reinforce the expensive factory equipment, the Works has a well-equipped chemical and physical laboratory where all the problems incident to the solution of every difficulty encountered are handled by thoroughly reliable experts and by modern methods. All raw materials are tested and inspected here, before they are sent out to each mill. With these facilities at its disposal, the Works is enabled to meet the severest specifications and to give to the users of its products a standard of quality that always ensures their entire satisfaction.

Sumitomo Electric Wire and Cable Works, Ltd.

OKIJIMA, OSAKA

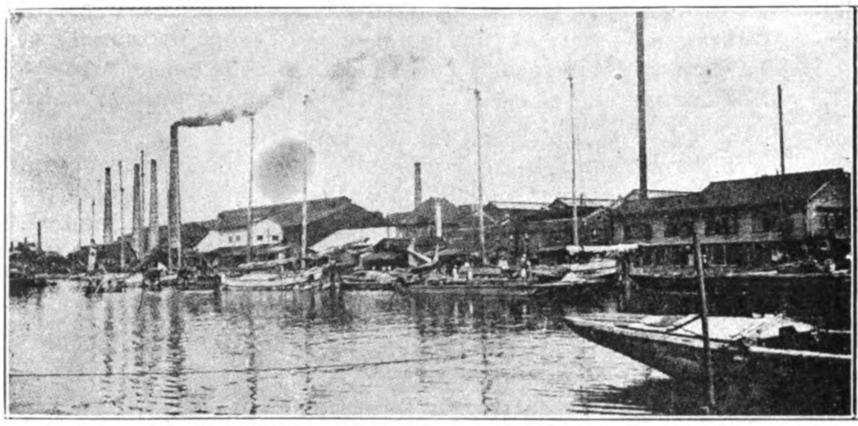
Managing Directors: Messrs. Yasuo Riko, Dr. Eng., and Denichiro Nishizaki.

The Sumitomo Electric Wire and Cable Works is in itself the most efficiently equipped electric wire and cable factory, east of Suez. Though its history is a comparatively new one, for it was first established in 1908, the Works, controlled by experienced hands, has turned out the first paper cable made in Japan.

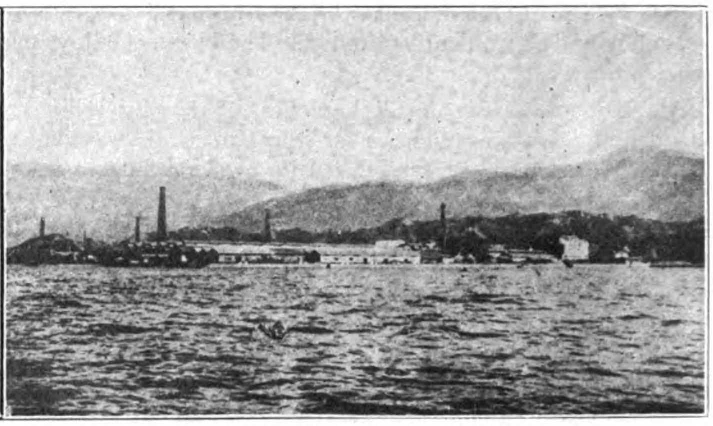
Since that date, in every branch of electrical engineering, great changes and advances have taken place only to be accompanied by a corresponding growth in the manufacturing facility of the Works. In its present buildings, which have been occupied three years, modern and up-to-date improvements in the manufacture of all sorts of wires, bare and insulated, have been invented and are in use. In fact, it is the only Works in the line where the system of "standardized production" has been introduced with great economy in the cost of production,—a fact which is demonstrated by its prosperity, and is well endorsed by the general satisfaction and appreciation shown with regard to its standard of quality in the markets, at home and abroad.

Its scope of manufactures ranges from bare wire and cable to all kinds of insulated conductors.

The New Tokyo Branch of the Sumitomo Bank



Amagasaki Branch Works, for making wire nails and galvanized wire.



Sumitomo Fertilizer Factory at Niihama

1. Bare Wires and Cables.—Plain or tinned, hard- and soft-drawn, copper wires. Copper tapes and bars. Round or grooved trolley wires. Brass, silicon and phosphor bronze wires. Aluminium wires. German-silver wires. Stranded wires of every description.

2. Insulated Wires and Cables.—(*a*) Rubber insulated wires and cables; electric-light, power, telephone and telegraph wires and cables; (*b*) paper insulated cables; underground power cables, dry-core and telephone and telegraph cables; (*c*) varnished-cambric insulated cables; (*d*) cotton and silk covered wires; all kinds of instrument wires, weather-proof aerial wires and cables; (*e*) lighting flexibles; (*f*) paraffined wires; (*g*) vulcanized bitumen cables; (*h*) enamelled wires.

3. Cable Accessories.—The rapidity with which the plant and business have evolved finds hardly a parallel elsewhere. The number of the workmen employed in 1911 was no more than 180, which has been increased at a bound to 2,000 during these six years. Its sphere of business activity now includes India, Java, Australia, Russia, China, Italy, Canada, etc.

Sumitomo Fertilizer Manufactory

Niihama, Iyo

Mr. Kamajiro Kajiura, *Manager.*

The manufactory covers 20 acres, 7 acres out of which is covered with various shops and store-houses.

Its manufactures are; (1) Sulphuric acid; (2) nitric acid; (3) superphosphate; (4) compound manure; (5) complete manure.

The annual output is about 12,000,000 *kwan* of sulphuric acid; 2,000,000 bags of super-phosphate; 1,000,000 bags of compound fertilizers.

Though one of the youngest among the firm's enterprises, its products are well known in all eastern markets. Among its export markets are Australia, India, South Sea Islands, Russia, Philippine Islands, etc.

The equipment of the plant has been chosen out of many European improved patterns. To reinforce this matchless factory, the firm's Besshi Mine offers abundant pyrite for manufacturing different kinds of fertilizer of superior quality. Pyrite from the copper mine enables the factory to produce more phosphate than any other chemical fertilizer works in Japan.

Sumitomo Steel Works, Limited

Shimaya-cho, Osaka

Baron Kichizaemon Sumitomo, president; K. Nakada, chairman of the board; J. Matsumoto, managing director; T. Sumitomo, M. Suzuki, K. Yukawa and S. Kato, directors; S. Kato and J. Kawada, managers,

The Sumitomo Steel Works was the first to set up in Japan in its line of business, producing steel castings with one 15-ton acid process; steel forging with four basic Siemen's furnaces, the total capacity being 68 tons and with hydraulic presses 2,000 tons, 1,600 tons and 600 tons respectively. Its products comprise:

1. Case steel crossings, turns, wheels, etc., for railways, collieries, mines, etc.

2. All of essential parts of marine boilers and engines, propellers, propeller-blades, anchors, marine steering gears and all sorts of things for ships and steamers.

3. Rollers for iron, copper and brass mills.
4. Hydraulic cylinders, etc.
5. Yokes for electric dynamoes, etc.
6. Gearings with straight or helical teeth.
7. Dredgers, buckets, etc.
8. All machinery parts that require the strongest strain.

All these products of the Works have Lloyd's certificate for reliable quality, and many other awards of merits conferred at the various exhibitions, both at home and abroad. A factory for steel rollings is now under construction. Annual melting capacity of the Siemens-Martin furnace is 20,000 tons of acid and 20,000 tons of basic steel.

The Sumitomo Bank, Ltd. (Successors to the Sumitomo Bank)

Head Office: Kitahama, Osaka.

Capital: Y.70,000,000; Paid up: Y.40,000,000; Reserve: Y.12,000,000.

Officers and Directors: Baron K. Sumitomo, president; Messrs. K. Yukawa, T. Kanoh, S. Yoshida and N. Yatsushiro, managing directors; M. Suzuki, K. Nakada and K. Hori, directors; T. Hamazaki, manager, head office. Chief shareholders: Baron K. Sumitomo, 153,720; Messrs. M. Sumitomo, 18,000; A. Sumitomo, 5,400; K. Sumitomo, 5,400; K. Sumitomo, 3,000; M. Suzuki, 2,500 and T. Sumitomo, 2,000.

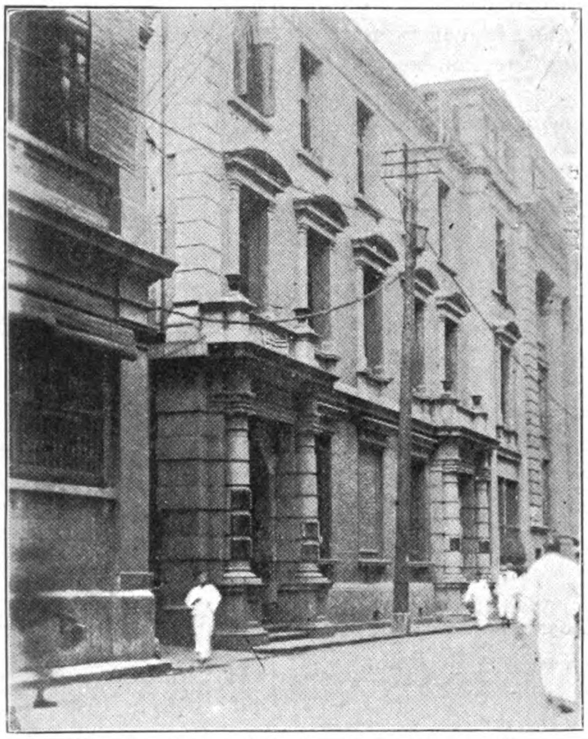
History.—Established in March, 1912. The Sumitomo Bank, one of the largest commercial and exchange banks of Japan, can be said, in a broad sense, to be older by four years than the Bank of England, having as its origin the Sumitomo firm, established in 1690. In its early days, the Sumitomo firm advanced loans to the Daimoyos under the Shogunate, and merchants of the city of Osaka which was then gaining its prominent position as the centre of commercial and industrial Japan. In 1895, the firm organized its old general financial business into a modern banking system with a capital of one million yen under the title of "Sumitomo Bank." Since December 31st, 1895, the bank has made steady progress, as may be seen from a statement on next page.

Dec. 31st		Deposit.	Loans.	Reserves.
1895	..	Y. 882,000	Y. 2,142,000	Y. —
1899	..	7,486,000	8,164,000	850,000
1903	..	19,468,000	16,220,000	1,950,000
1907	..	32,596,000	26,539,000	3,400,000
1911	..	44,348,000	35,391,000	4,800,000

The private bank was converted into The Sumitomo Bank, Ltd., in April, 1912.

Dec. 31st		Deposit.	Loans.	Reserves.
1912	..	Y. 51,937,000	Y. 43,909,000	Y. 200,000
1915	..	86,123,000	75,014,000	1,100,000
1917	..	187,620,000	163,677,000	2,100,000
1918	..	269,250,000	251,700,000	4,100,000
1919	..	348,359,000	345,582,000	6,500,000
1920 (Jan. 30th)		359,764,000	375,155,000	12,000,000

Many important branches were established, and the foreign exchange department opened in 1905, with numerous correspondents in the principal centres of the world. In 1912, it was incorporated as a joint stock company and its capital brought up to Y.15,000,000, the greater part being subscribed by the Sumitomo family. In July, 1917, the capital was further increased to Y.15,000,000 and in April, 1920, another increase to Y.40,000,000 was decided on, and public subscription invited, with great success each time. At present, with a capital of Y.70,000,000 and 2,327 shareholders it occupies a foremost position in the banking system in Japan, with branches in London New York, Shanghai, Honolulu, Seattle, etc.



Shanghai Office of the Sumitomo Bank and Sumitomo Goshi Kaisha

China Offices

Distributing and sales offices for the Sumitomo products in Central China were opened in Shanghai in November 1916. Since then this office has taken over the agency of the Fuso Marine and Fire Insurance Company and handles the Sumitomo investments in Chinese industrial and mining enterprises. This office is under the direction of Mr. C. Fukuda. A fine new building has since been erected in Kiukiang Road in the heart of the business district which houses the Sumitomo Bank and the commercial departments. A Tientsin branch is maintained at 42 Rue du 14 Juiellet under the management of Mr. S. Sakamoto and one at Hankow directed by Mr. T. Kubota.

Yangtze Commission

Preparing for Mr. Palmer's Visit

Mr. George G. Stroebe has been engaged by the technical committee of the Yangtze river commission to survey the Yangtze River preparatory to the improvement of this great waterway of China. A party consisting of Mr. van der Veen, a member of the committee, Mr. T. C. Shoung, chief secretary of the commission, and Mr. Stroebe, in the capacity of the chief survey engineer, left Peking for Hankow to make a study of the river. They will go down the river from Hankow to Shanghai, and at Nanking will be joined by Mr. Yang Pao-ling, another member of the committee.

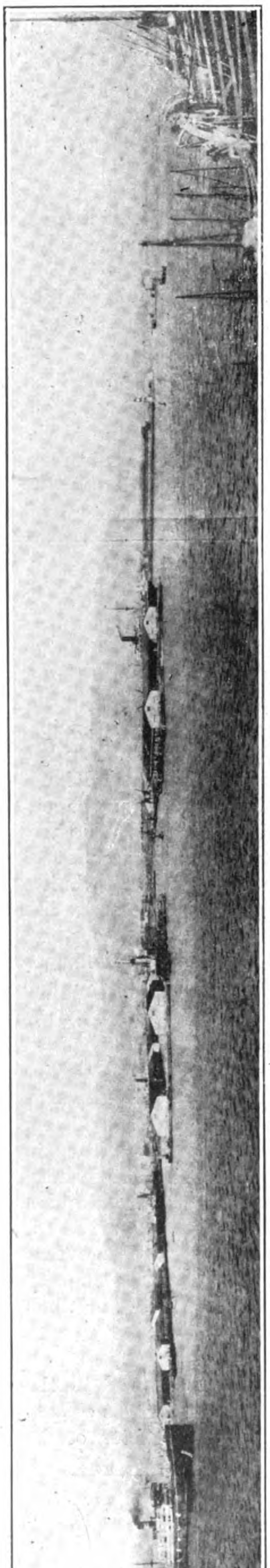
An office will be established at Shanghai, in charge of Mr. Stroebe, to carry on the survey work, and the head office is at Peking. After sufficient hydrologic data have been collected about the river, Mr. F. Palmer, the world-known hydraulic engineer, who made a trip to this country last year, will come out again from England to study the river and give his expert opinion with regard to the improvement of it. The importance of collecting enough data upon which a comprehensive scheme of improvement can safely be based is generally admitted.

The technical committee of the commission under which the survey work will be undertaken was organized in May. Its members are Mr. H. van der Veen, adviser to the ministries of the interior and communications ; Mr. Yang Pao-ling, a well-known Chinese hydraulic engineer ; Mr. H. von Heidenstam, chief engineer of the Huangpu conservancy board ; Mr. Chow Zian-yien, principal technical expert of the ministry of the interior ; Capt. T. J. Eldridge, customs coast inspector ; Mr. Sun Ping-wang, chief of the Kiang-huai surveying bureau ; and Mr. Chen Shih-li, chief of the engineering department of the ministry of the interior, who was unanimously elected chairman of the committee on account of his experience and seniority. All of these members are technical men of recognized ability. Sir Francis Aglen, inspector-general of customs, Mr. Sun Pao-chi, director-general of the customs administration, and Mr. Kao Ling-wei, former minister of finance and minister of the interior, have given the undertaking much encouragement, and have done everything within their power to make it a success.

Mr. Stroebe has been in the Philippines government service for more than 12 years as hydraulic engineer, in which capacity he designed irrigation, river and harbor works, and a municipal water supply. He graduated from the University of Chicago in 1900 and the University of Michigan in 1904, and subsequently taught civil engineering in the latter university for four and a half years. Before going to the Philippine Island he worked for the United States reclamation service, which does all the government irrigation work, and also for the Canadian British Company as bridge designer. When the United States declared war upon Germany, Mr. Stroebe enlisted immediately and was assigned to the engineer officers' training school at Fort Leavenworth, Kansas. He was commissioned captain of engineers, and served in the Philippine Islands, where, at the close of the war, he was colonel of the regiment of engineers of the first Philippine division of the United States army.

Japan to Make Tin Plate

The Imperial Steel Works at Yawata, Japan, has completed construction of its plant for making tin plate. This plant was erected with a view to checking imports of tin plate from America. Its estimated annual capacity is 20,000 tons, although, Commercial Attaché James F. Abbott reports from Tokyo, the first year's production is not expected to exceed 6,000 tons.



View of Kobe Harbor Improvements taken from Harbor

Port of Kobe Improvements

By K. Morigaki, Chief Engineer

THE port of Kobe (Hyogo harbor) is situated in the southwestern part of Settsu province twenty miles from Osaka and embraces Kobe and Hyogo bays. It faces south and is sheltered on the north by the Rokko mountain range which rises two miles from the coast. In olden days Kobe was a straggling fishing village, but after the building of the Osaka castle in 1583 (the 11th year of Tensho) by Toyotomi Hideyoshi it grew in importance as a distributing centre.

On the 7th of October, 1867 (3rd year of Keio), the opening of Hyogo harbor for foreign trade was sanctioned by imperial decree, and in the following year, 1868 (the first year of Meiji), two Unjosho (excise offices), east and west, were established, and four piers and three warehouses, were constructed constituting the first accommodations for foreign trade in Kobe.

In 1873 (the 6th year of Meiji) the Unjosho were renamed, "The Customs." Since that time the wharves, piers, warehouses and sheds have been improved and added to year by year. By 1901 (the 34th year of Meiji) eight warehouses, fourteen sheds and nine cranes had been erected on Wharves No. 1 and 2 and the Onohama wharf. In addition, Kawasaki, Hyogo and No. 4 wharves had received noticeable improvements. The following year, 1902 (the 35th year of Meiji), the two breakwaters, one 600-ft. long to the east and the other 660-ft. long to the west, off Onohama, were completed.

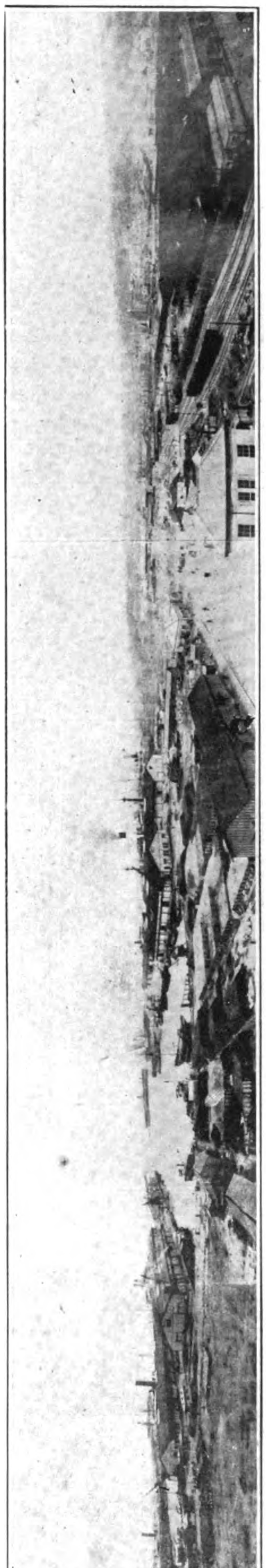
Foreign trade in Kobe has developed by leaps and bounds and at present Kobe is universally regarded as one of the largest trading ports in the Far East. The following table shows the progress of Kobe trade every fifth year since 1873 :—

Exports and Imports

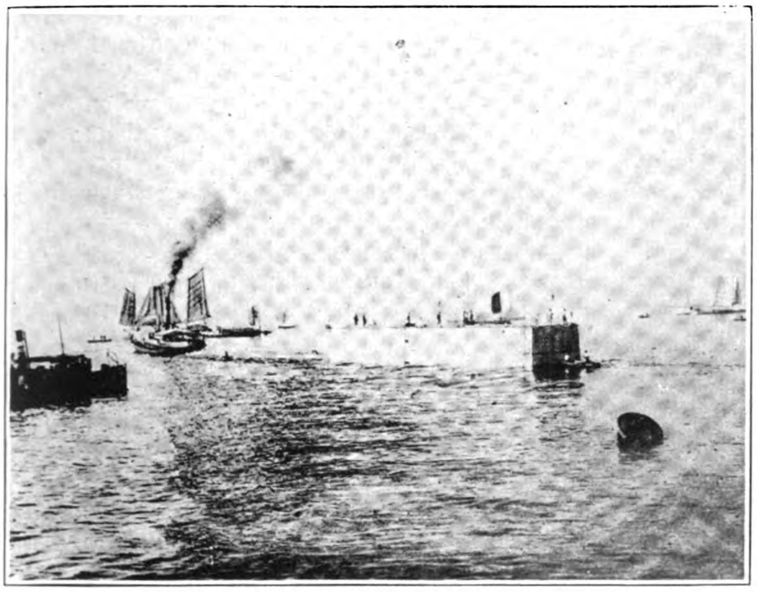
Year	Values of Exports and Imports	Increase compared with previous year	Percentage increase
	Yen	Yen	Bales
1873	8,441,869	—	—
1878	12,531,535	4,089,666	85
1883	12,961,841	430,306	3
1888	42,971,975	30,010,134	211
1893	66,263,250	23,291,275	54
1898	198,253,442	131,990,192	191
1903	245,052,228	46,798,786	24
1908	275,195,639	30,143,411	12
1913	522,727,527	247,231,883	14
1918	1,352,482,464	830,054,937	32

From the above it will be seen that the rate of progress of exports and imports combined, at the end of every fifth year, shows an average increase of about seventy per cent.

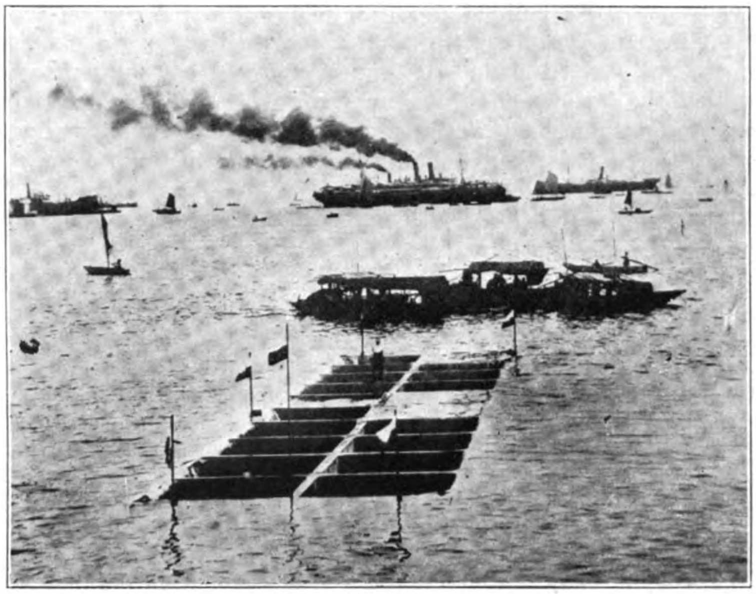
The prevailing wind of the port comes from the north, but because of the shelter afforded by the Rokko range of mountains, it does not interfere with shipping in the harbor. In winter westerly winds sometimes visit the port but owing to the geographical position of Wada point they are not harmful. However, during the summer months southerly and easterly winds visit the port and these winds sweeping over the large expanse of open water between Kobe and Osaka frequently cause damage to the small craft in the bay. In spite of this, records show that operations in the harbor are never suspended, owing to rough water, more than twenty times during a year.



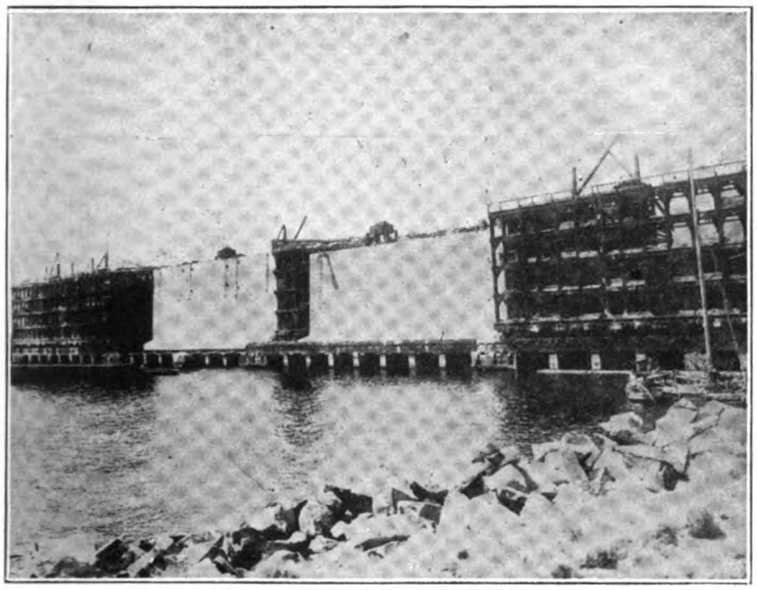
View of Improvements from Customs Compound



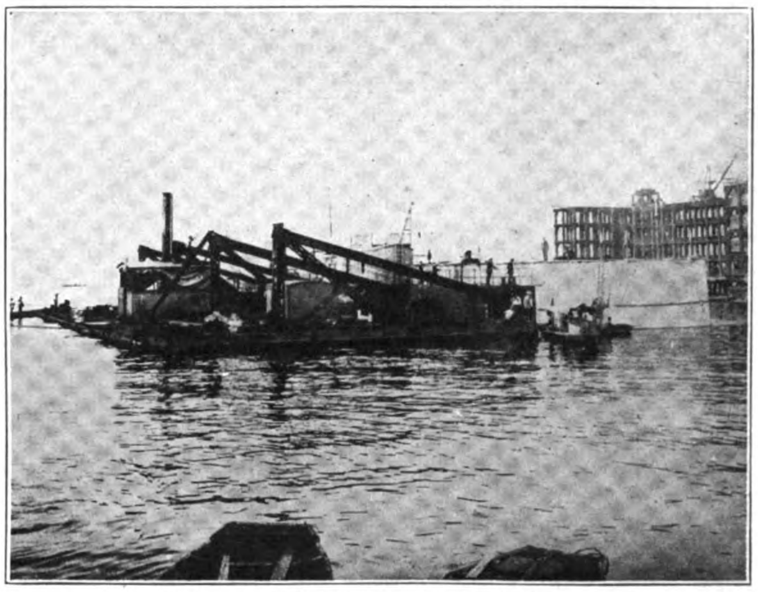
Caisson Towed to its Site



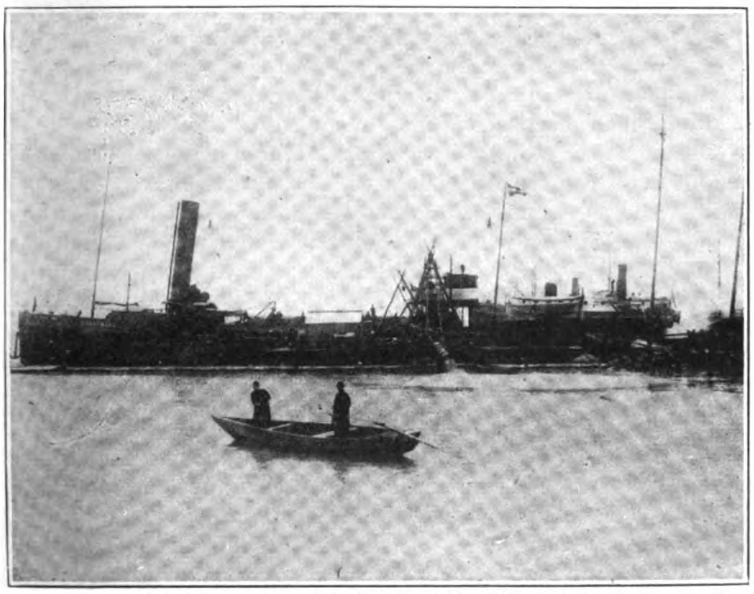
Caisson Being Deposited



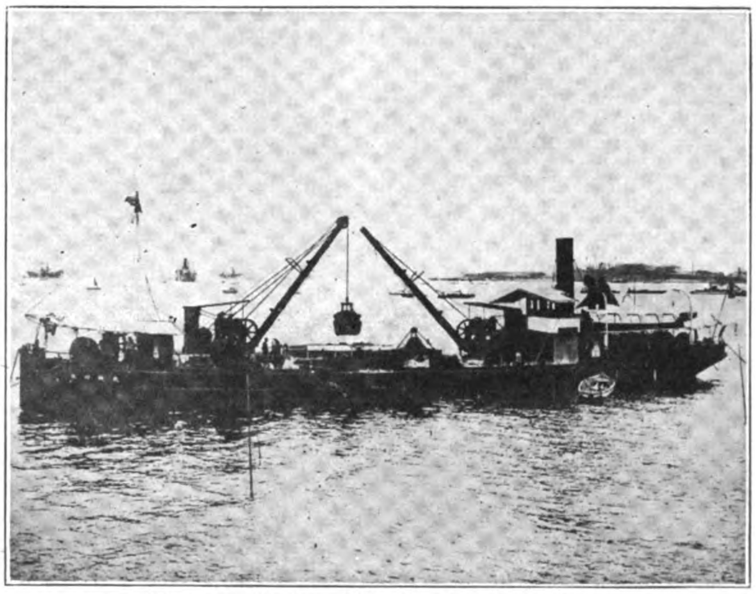
Ferro-Concrete Caisson on the Casting Pier



Caisson Leaving the Depositing Dock



Sand Pump Dredger "Dokai Maru" at Work



Priestman Dredger "Owada Maru" at Work

The harbor which is deep with a slightly slanting bed has no stream carrying alluvial deposits into the harbor and consequently the bottom, consisting of mud and sand, affords a very safe anchorage. Kobe harbor itself is ideal from point of location, but because of the sudden tradal expansion of the port, the piers and terminals were soon found to be inadequate.

As a temporary measure to meet this sudden and rapid development of the port, plans were drawn up for a mole and a steel pier

at Onohama to be built in six years at an estimated cost of Yen 3,960,000. In April 1906 (the 39th year of Meiji) work on this project was started under the supervision of the construction bureau of the department of finance. However, as these tentative plans were insufficient to meet the requirements of the increasing trade of the port, further changes were made for the improvement and extension of the harbor.

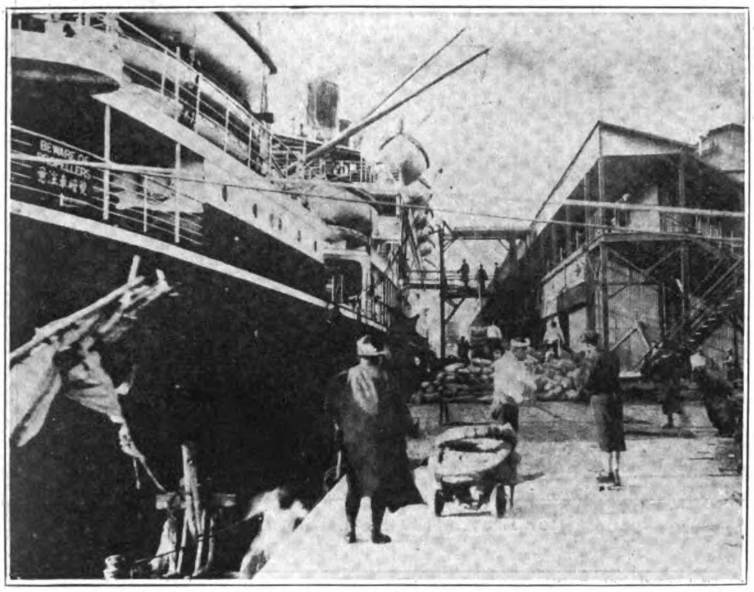
In September. 1906 (the 39th year of Meiji) Mr. Sakatani, the minister of finance, came from Tokyo and suggested a general plan of improvement. The city of Kobe being aware of the wonderful opportunities saw the necessity of these improvements and volunteered to bear a portion of the expenses incurred. The original plan of 1906 was altered to reclaim the foreshore from the projection of Onohama on the east, to the front of the former foreign concession on the west, providing thereby accommodations for the handling of 4,000,000 tons of cargo per annum. The plan also provided for the most modern improvements of facilities for the handling of sea and rail traffic between Kobe and Hyogo. The original estimated cost was to be increased to Yen 28,905,145, by a supplementary budget and in March, 1907, the plan was revised to divide the work into two sections.

First Section.—Being most urgently required it was decided to construct first, the four wharves on the foreshore of the reclaimed ground at Ono at a total cost of Yen 17,099,407, with accommodations for handling 2,100,000 tons of cargo per annum and to be completed in eight years. This estimate (Yen 17,099,407 of which Yen 437,907 was borne by the city of Kobe) was the amount increased by Yen 13,139,407 to the original estimate (Yen 3,960,000). In September, 1907 (40th year of Meiji) elaborate commencement ceremonies were held at No. 1 mole attended by Mr. Sakatani, the minister of finance. From that time the work proceeded satisfactorily but it became necessary to extend the period in which these improvements were to be completed, and the scheme was modified. This was found necessary owing to the general advance in prices as a result of the great world war, and it was decided to complete the work in sixteen years, i.e., from the 39th year of Meiji to the 10th year of Taisho, at a total estimated cost of Yen 15,092,037 of which Yen 3,669,802 was to be borne by the city of Kobe.

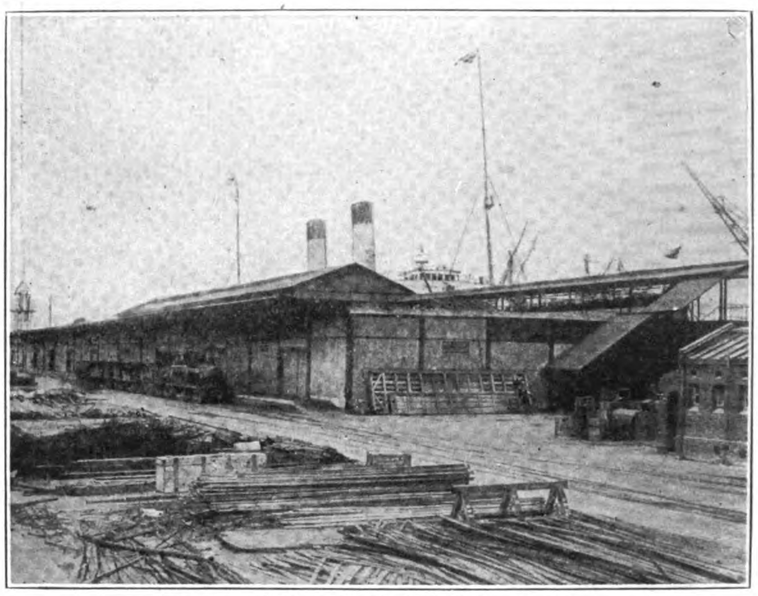
As a result of the war, exports and imports in Kobe increased suddenly, and consequently at the beginning of the 6th year of Taisho there was great need for government warehouses as well as private warehouses for storing imported goods. Lack of landing space made it difficult to land goods which had been discharged into lighters and the wharves became badly congested. This was of great inconvenience to importers and exporters but fortunately a completed portion of the harbor improvements were soon used to relieve the congestion. Moreover, to secure additional relief, temporary sheds covering 6,006 *tsubo* in area were erected on the reclaimed ground between No. 1 mole and No. 2 mole and on No. 3 mole at a cost of Yen 180,000. Notwithstanding the serious congestion on the wharves, by the 9th year of Taisho exports and imports amounted to more than 2,000,000 tons, an amount greatly beyond all expectation.

1 *tsubo* = 1 *ken* sq. 1 *ken* = 2 yards.

The harbor improvements called for in the first section of the program were completed by the 10th year of Taisho. During this time there was a revision of the government organization. On the first of June, 2nd year of Taisho, the Kobe branch of the construction bureau of the finance department was abolished, and after that all the improvements were carried out under the supervision of Kobe branch of the construction section of the secretary's department of the finance minister.



Steamer Discharging at "A" Shed, Pier No. 1.



Eastern Side of "A" Shed, Pier No. 11.

2. Outline of Reclamation and Construction

Prior to the construction of the landing pier at Onohama, additional accommodations for storing imported goods were started at Kawasaki customs compound in 1906. Nine wooden sheds, covering an area of 3,330 *tsubo*, were built, as well as temporary office, numerous roads and wooden piers. Two years later, the eastern portion of No. 1 Hatoba or western customs was reclaimed and two wooden sheds were built which covered 525 *tsubo*.

The modified project was to build four moles with intervals of 480-ft. and 540-ft. The mole to be built at the eastern extremity was one, whose eastern side was to act as a wave-breaker and its inner side as a quay. This mole will be 180-ft. in width and 1,290-ft. in length, while the others to have a nearly uniform length of 1,200-ft. and width of 336-ft. respectively. The reclaimed foreshore was to extend from the headline at Onohama on the east to the front of the former concession on the west, and it was necessary to fill in the sea which was about 20-ft. deep where the four moles were to project.

Reclamation.—The reclamation work was commenced in 1907 and completed in 1921 at an expense of approximately Yen 518,858. The total area of the reclaimed ground, including moles, covers about 65 acres and is 11-ft. above the mean low water spring tide. (Sand pump and Priestman dredgers constituted the main floating equipment for the work.)

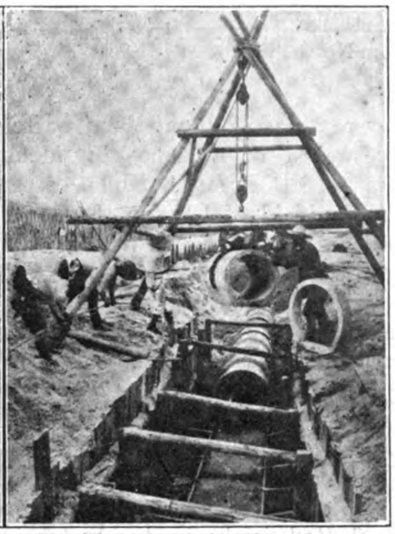
Dredging.—The total dredged area covers about 270 acres between and in front of the moles, depth of dredging varying from 30 to 36-ft. below M.L.W. level, according to the depth of the quay walls.

Depth of the space between Moles No. 1 and No. 2
Northern part. 33-ft. below L.W.L.
Depth of the space between Moles No. 1 and No. 2
Southern part. 36-ft. below L.W.L.
Depth of the space between Moles No. 2 and No. 3.
30-ft. below L.W.L.
Depth of the space between Moles No. 3 and No. 4.
30-ft. below L.W.L.
Depth of the western part of Mole No. 4
and general fairway. 30-ft. below L.W.L.
Depth of the fairway in front of No. 1 mole
and No. 2 mole. 36-ft. below L.W.L.

Of the mud obtained by dredging, amounting to about 318,740 *tsubo*, sixty per cent. was utilized for the lower layer of the reclaimed ground, sand being deposited on the upper part.

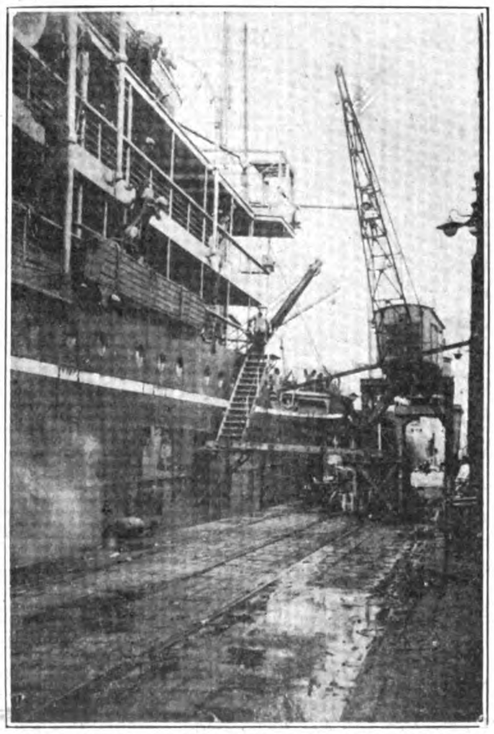
Dredging was commenced in 1909 and completed in 1918 at an expense of about Yen 221,531. (Priestman type dredgers were chiefly used in this work).

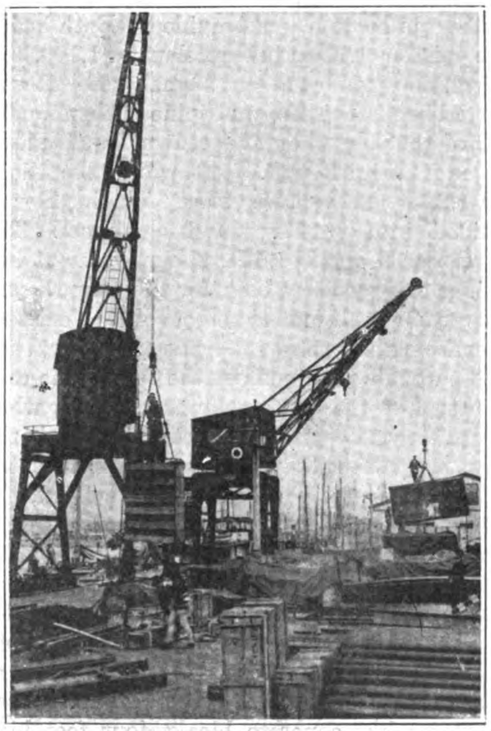
Steam Rollers at Work on New Road


Laying the Main Sewer Pipes

LIGHTER WHARVES AND SEA WALLS.—No. 1 lighter wharf is 258 yds. in length and No. 2 and No. 3 wharves are 160 yds. and 180 yds. respectively, all of which were built upon concrete blocks piled on a rip-rap foundation. Numbers 1 and 2 wharves have upward slope, from a height of 7.5-ft. above L.W.L. up to the edge of the reclaimed ground in order to facilitate the handling of cargo by hand to and from lighters. The foreshore between Moles No. 2 and No. 3 was constructed with a steep slant in order that the charging and discharging of lighters could be done by cranes. Steel stairs, steam portable or hand fixed cranes together with numerous bits and rings were installed on all the wharves. These are available for mooring lighters and launches drawing about 9-ft. of water. The wharves were commenced in 1908 and completed in 1922, costing nearly Yen 263,635. The eastern side of No. 1 mole, which was built as a sea wall, is about 706 yds. long and was built of concrete blocks upon a rubble mound. This wall is 17-ft. above L.W. L. The work was started in 1907 and finished in 1914 at an expense of Yen 408,759.

QUAY WALLS.—The total length of the quay walls is about 9,556-ft. with 8,172-ft. available as follows :


Electric Traveling Crane unloading Cargo from Steamer

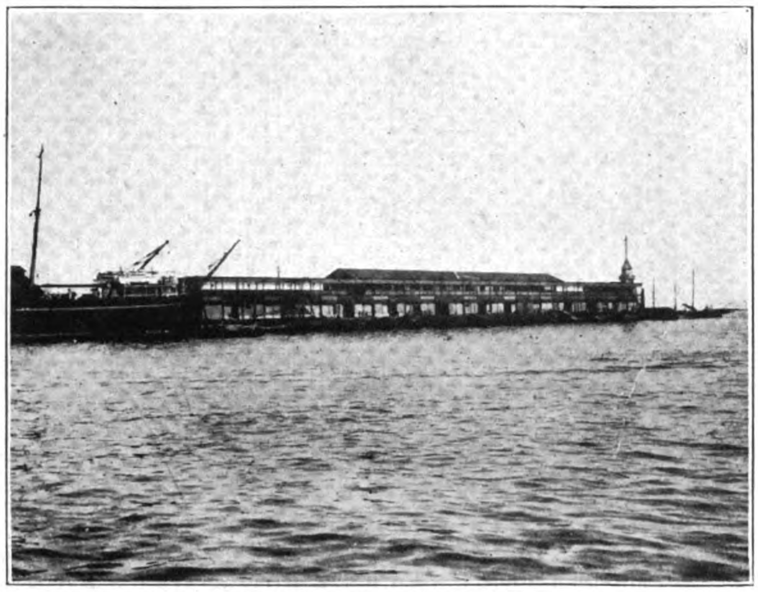

Electric Traveling Crane loading Cargo into Lighters

Quay	Height of Walls	Depth of Water below L.W.L. Level	Effective Length	Number of Ships Alongside
No. 1 mole southern part	47-ft.	36-ft.	780-t.	1
No. 2 mole east side southern part ..	47 ,,	36 ,,	780 ,,	1
No. 1 mole northern part	44 ,,	36 ,,	462 ,,	1
No. 2 mole east side northern part ..	44 ,,	33 ,,	390 ,,	1
No. 2 mole western side	44 ,,	33 ,,	1,134 ,,	3
No. 3 mole and No. 4 mole	41 ,,	30 ,,	4,626 ,,	12
Total			8,172 ,,	19

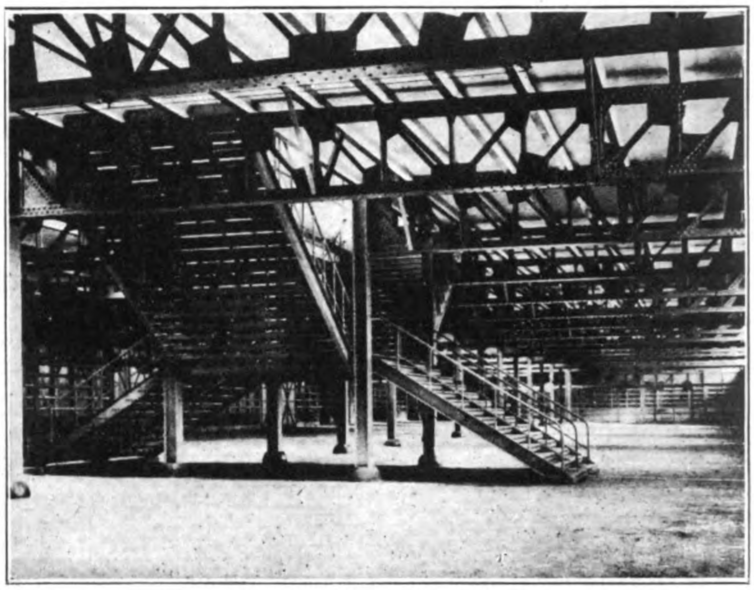
Presuming that 250 tons of cargo per foot were handled per annum, the total accommodations of the quays for loading and unloading cargo would be 2,100,000 tons per annum. Nineteen vessels can be moored alongside the quay walls at one time.

The sea bottom consists of soft mud to a depth of 6 or 7 ft. with layers of fine sand or hard clay underneath, but as a whole it lacks uniformity of strata, which fact caused serious inconveniences when putting down the foundations of the quay walls. After careful consideration, it was decided to construct a series of ferro-concrete caissons, the idea being to simplify the work of erection and to distribute the load over as broad as possible. Caissons were prepared beforehand on shore, towed to and deposited on their site, after which they were filled with concrete and sand. At the commencement of the operations the bottom was carefully tested to determine to what depth it would be necessary to bore to secure a firm bed upon which the caissons could be deposited. It was found necessary to dredge about ten feet to secure a bed which would be sufficiently firm to bear the weight of the caissons required.

In order to build the caissons on shore, comb-shaped wooden piers three blocks long were



"A" Shed from No. 2 Pier



Interior View of "A" Shed

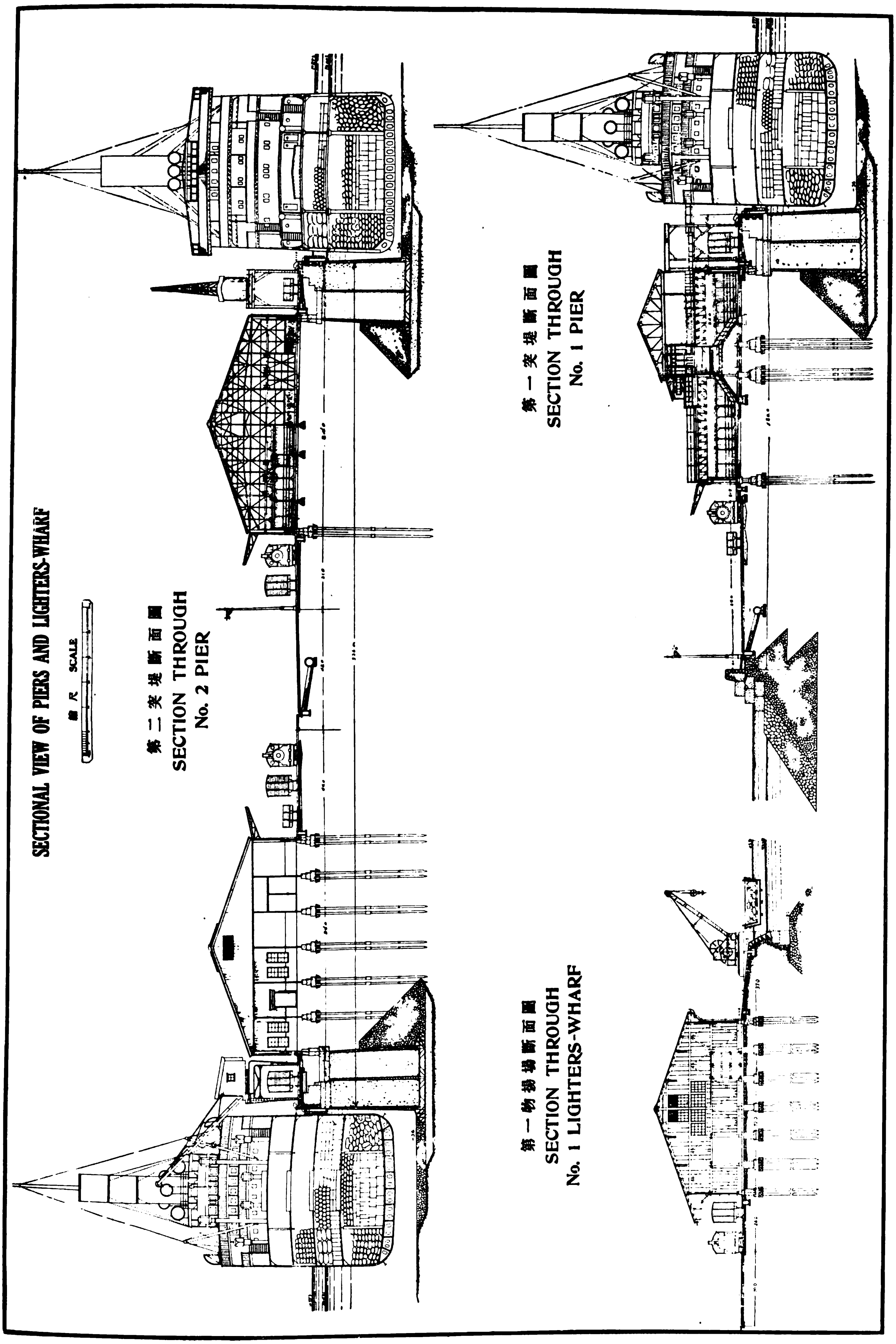
constructed and the caissons were made upon them, after which they were floated by means of a depositing dock which was built at the Kawasaki Dockyard, Kobe, after the design of Messrs. Clark and Standfield of London, England. The dock measured 145-ft. in length, 137-ft. in width and 51-ft. in height. Eight pontoons were attached in a comb-like shape, leaving respectively a space larger than the width of the projections of the above-mentioned piers. To receive the caisson on the pier, the pontoons were pushed into this space. The pontoons were made of steel, oblong in shape, 17-ft. deep, 12-ft. wide and 70-ft. long. Inside the pontoons, were valves for taking in and letting out the sea water, so as to adjust the floating and submersion of the dock. A large outrigger 4-ft. deep, 67-ft. wide and 137-ft. long was fastened to one side of the wall by means of two steel columns and booms. This floated freely on the water to counterbalance the weight of the dock when it was loaded. Upon the side wall, engines and all other equipments were provided to serve as headquarters for the dock operations. According to the depth of the water, different size of caissons were used but most of them were for water of 30-ft. depth. These caissons were 35.5-ft. high and 22.85-ft. wide on the top, and for stability's sake 4-ft. wide and 4-ft. high around the bottom was provided. Both inside and outside walls of the caissons had an inward slant of 1,120, but the two ends were vertical, and from each end a small vertical wall projected to which the adjacent caisson was joined when under the sea. The thickness of the side walls and central longitudinal portions of the walls ranged from 1.5-ft. to 0.675-ft. while 9 partitions were 0.67-ft. at top and 1.22-ft. at the lower part. The interior of the caissons were divided into twenty small chambers. The caissons when in place appeared about 1.5-ft. above water at low tide and a steel water-tight cap specially built for the purpose was placed on top of the walls to cover all four chambers of each caisson. After pumping the water from the two of the front chambers, they were filled with concrete through a cylinder at the top of the cap, and sand was filled into two of the other chambers. Thus when 10 chambers were filled alternately with concrete and sand, the main body of the caisson was completed and formed a unit of the foundation of the quay walls. After the caissons were filled, the masonry and concrete work was built upon them forming the superstructure. Each caisson is 120 feet in length, and ten were required for each side of a mole. When in place, to avoid unequal settlement, a space about six inches was left between caissons, which was later filled in with concrete. The ferro-concrete caisson for 30-ft. depth of water weight about 2,000 tons while those in 33-ft. and 36-ft. of water weighed 2,300 tons. Caissons of the same size were used in 33-ft. and 36-ft. of water but concrete blocks four feet high were placed upon the tops of those in deeper water, to make up the difference. The total number of caissons used for the quay walls were 80, and the operations begun in 1911 was finished in 1918, at a total expenditure of Yen 2,825,400. This expenditure includes mooring posts, bollards, steel rings and staris, for all the quay walls.

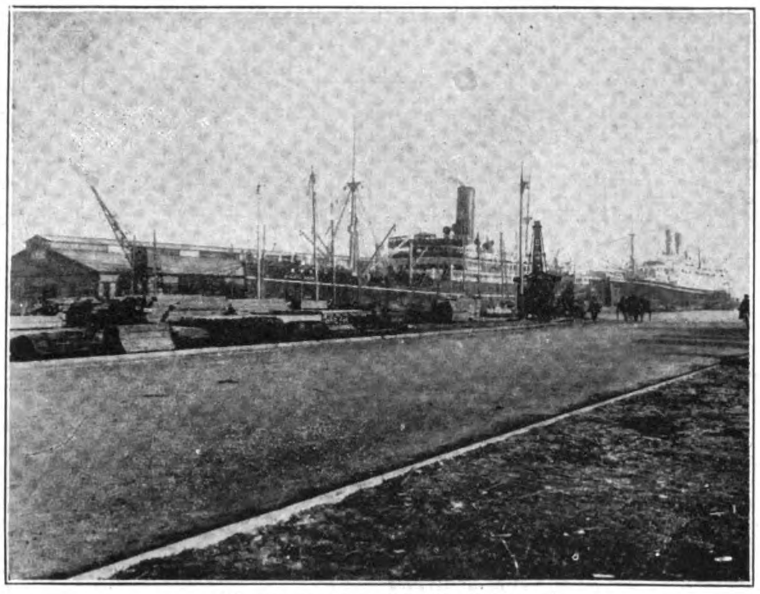
SHEDS.—Sheds were constructed of steel and of wood, totalling in all eighteen. The steel sheds are on the moles, and are used by ocean-going steamers, while the two wooden sheds are for lighters. The steel sheds cover an area of 539,451 sq. ft. each shed measuring from 288 to 540-ft. with a uniform span of 84-ft. The two wooden sheds were built at No. 1 lighter wharf, both with a span of 72-ft. and cover an area of 38,316 sq. ft. The sheds on the moles were built paralled to the quay wall and 23-ft. from the edge. The wooden sheds were built at a distance of 32-ft. from and parallel with the lighter wharves. The particulars of the sheds are follows:

Shed No.		Length ft.	Span ft.	Area sq. ft.	Places where Built
1	Wooden	336	72	24,192	No. 1 lighters wharf.
2	,,	192	72	13,824	do.
A	Steel	540	84	60,147	No. 1 mole.
B	,,	468	,,	39,312	do.
C	,,	504	,,	42,336	East side of No. 2 mole.
D	,,	504	,,	42,336	do.
E	,,	360	,,	30,240	West side of No. 2 mole.
F	,,	288	,,	24,192	do.
G	,,	360	,,	30,240	East side of No. 3 mole.
H	,,	288	,,	24,192	do.
I	,,	504	,,	42,336	West side of No. 3 mole.
J	,,	432	,,	36,288	do.
K	,,	360	,,	40,824	East side of No. 4 mole.
L	,,	288	,,	24,192	do.
M	,,	288	,,	24,192	do.
N	,,	360	,,	30,240	West side of No. 4 mole.
O	,,	288	,,	24,192	do.
P	,,	288	,,	24,192	do.
		16 steel sheds		539,451	
		2 wooden sheds		38,016	
		Total 18 shed.		577,467	

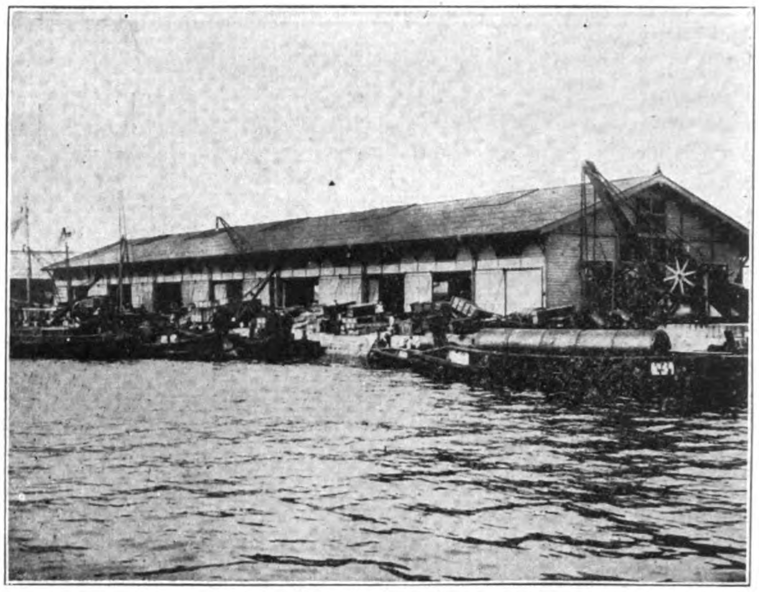
N.B.—The area 60,147 sq. ft. of A shed includes 14,787 sq. ft. of the second story. The area 40,824 sq. ft. of K shed includes 10,404 sq. ft. of second story.

The floors of all the steel sheds are of asphalt and concrete, and those of the wooden sheds of granolithic concrete. The floors of all sheds are the same level as the quay wall, with the exception of the two steel sheds A. and K. These sheds are of special two


SECTIONAL VIEW OF PIERS AND LIGHTERS-WHARF
縮尺 SCALE
第二突堤斷面圖
SECTION THROUGH
No. 2 PIER
第一突堤斷面圖
SECTION THROUGH
No. 1 PIER
第一物揚場斷面圖
SECTION THROUGH
No. 1 LIGHTERS-WHARF



Steamers alongside No. 1 Pier



Lighter Wharf near "Kyobashi"

story construction for the convenience of passengers to and from steamers. On one side of these sheds is a railway platform about two feet high while the other side is the same level as the quay making a slight slope of 1/42. Inside the sheds are electric lights which facilitate the handling of cargo at night. The construction of the sheds was commenced in 1910 and completed in 1921 at a total cost of Yen 2,616,210 of which Yen 65,958 was for the wooden sheds.

RAILWAY.—One line between the steel sheds and quay walls, 2 or 3 lines behind the sheds, and several lines through the reclaimed ground were laid down, according to the Japanese government railway regulations. All these lines are connected with the main line at the Onohama station and are of 3-ft. 6-in. gauge, the total mileage being over 10 miles. 21 turntables (diameter 15-ft. and 14-ft.) and 6 weight-bridges (capacity 30 tons and 24 tons) were provided, and 1.6 miles of broad-gauge rails 13-ft. 6-in. wide for the electric traveling cranes were laid along the quay walls in front of the steel sheds. The operations commenced in 1910 were completed in 1922 at a cost of about Yen 474,221.

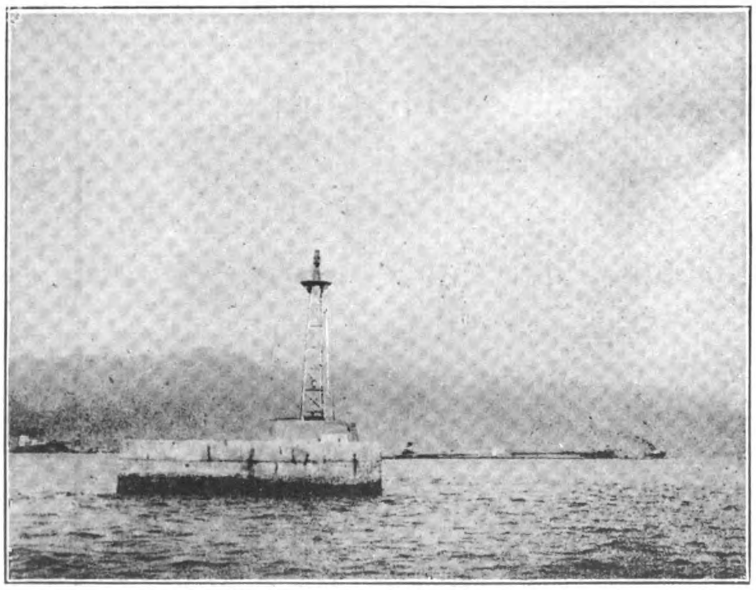
ROADS AND BRIDGES.—Well paved roads of asphalt varying in width from 42-ft. to 72-ft. connect all the moles with the main business section. The total length of the roads is 4,720 yards. On the quays and entrances to all sheds pavings of granite stones were put down. The Kyobashi bridge 66-ft. wide and 66-ft. long, and high enough to allow lighters to pass underneath was built between the north-western part of the reclaimed ground and the main road of the former foreign concession. The operations begun in 1908 and finished in 1922 at a total expenditure of about Yen 837,788.

CRANES.—Each quay has electrically operated traveling cranes of various capacities ranging from 1½ tons to 5 tons.

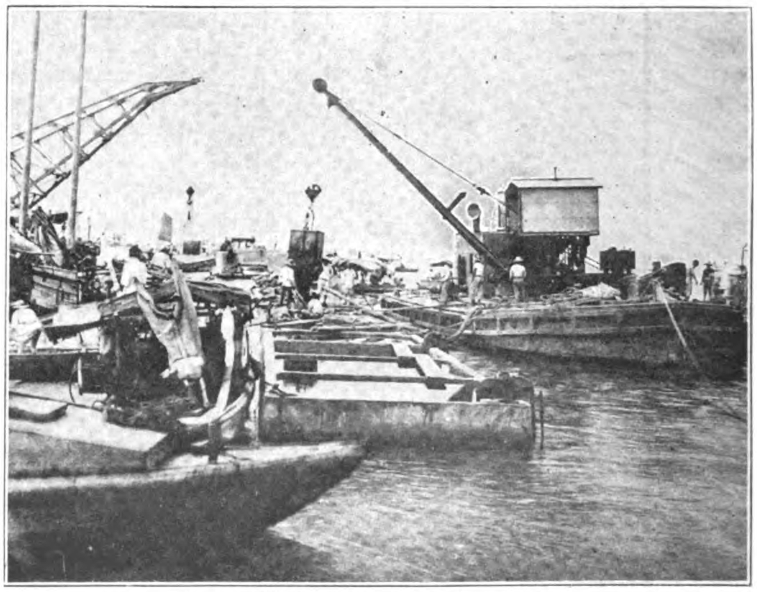
They travel along the quays in front of the sheds and handle cargo directly to and from the hatches. On each side of the quays, two 1½ tons cranes and one 5 tons crane were installed, the total number on the moles being fourteen 1½ tons cranes and seven 5 tons cranes. The electric power is supplied from the generating station of the Kobe city office and is distributed through underground cables by the sub-station in the customs compound. Besides the above-mentioned cranes, one 30 tons and four 5 tons fixed hand cranes in front of the wooden sheds were installed. The first of these cranes was erected in 1908 and the last in 1922. The total expenditure including the cost of the sub-station office amounts to Yen 650,306.

ELECTRIC LIGHT AND WATER SUPPLY.—Electric lights were installed along the roads of the new compound, and electric as well as gas lights were installed along the quays.

Water mains were laid along the quay walls for supplying vessels and underneath the side-walks of the main roads of the customs compound numerous fire hydrants were installed. The work was commenced in 1910 and completed in 1922 at a cost of Yen 182,700.



View of Eastern Breakwater



Eastern Breakwater under Construction

Miscellaneous.—Two powerful tugboats costing Yen 214,-750 (length 100 and 95-ft. width 24-ft. and 23-ft. and depth 12-ft. and 11.5-ft. respectively) were provided for assisting vessels alongside the quays. Two iron foot bridges to be used as passenger gang ways were added as well as a signal tower on the No. 1 mole for displaying berthing signals to vessels entering the port. The total cost of all the miscellaneous accommodations was approximately Yen 142,536.

3. Utilization of the New Accommodations of the Chief Officials

Since October 1913, the completed portions of the new harbor accommodations have been used by the public, and the construction bureau has exerted their best efforts to insure their full utilization. In 1920, the total amount of imports and exports, including intermediate cargo, reached 5,544,000 tons, and 47 per cent. of this amount or 2,066,000 tons passed over the moles, taking advantage thereby of the new facilities. As the original object of the improvements was to provide accommodations and facilities for handling 2,100,000 tons of cargo per annum, it will be seen from the above that even before their completion, this objective amount was nearly realized. From this it will be clearly understood how important the improvement works of Kobe harbor were to foreign trade.

Since January, 1917, the railway facilities connecting the main line system at Onohama station with the custom compound have been in use and in 1920 the total amount of cargo, loaded or unloaded, reached 179,000 tons on 68,000 trucks.

All these works are under the jurisdiction of the construction section of the department of finance, and were carried out by the Kobe branch of the section.

Chief Officials—Head Office (Tokyo)

Director :	K. Yabashi, D.SC.
Business-Controller :	F. Kimoto.
Architect :	T. Chichibu.
Civil Engineer :	H. Inoue.

Branch (Kobe)

Chief :	O. Matsumoto.
Chief Engineer :	K. Morigaki, D.SC.
Architect :	J. Ikeda.
Civil Engineer :	Y. Asai.

4. Second Section: Outline of the Improvements of Kobe Harbor Under Construction

The completed parts of the new accommodations of Kobe customs, as already mentioned, have been utilized since October 1913. The east breakwater, 1,264 yds. long, and the south breakwater, 1,000 yds. long, were commenced in 1910 and 1917 respectively to protect the new harbor accommodation. Although the accommodations of the harbor have continually been increased, the great European war had the effect of increasing the domestic and foreign trade of the port to such an extent, that further improvements and extensions of the harbor were necessary. The city of Kobe saw the necessity of expediting these additions and volunteered to bear part of the expenditure of the undertaking. The government thereupon transferred the control of the construction of the above-mentioned breakwaters to the home department in April 1919, and decided to commence extending the equipments of the port for handling domestic and foreign trade. The estimated cost of these extensions was Yen 27,100,000 and called for completion of the program by 1929.

The program includes the improvement at Hyogo of facilities for domestic trade, and an extension of facilities on the seafront of Hamabe-dori for foreign trade; an extension of the facilities at Kaigan-dori, for both foreign and domestic trade; the reclamation of the seashore of Hyogo and Kobe; the establishment of more landing and moorings, places for lighters; and an extension of the breakwaters for the purpose of securing a larger protected anchorage.

I

The improvements on the reclaimed ground, for foreign trade, are to be carried out by the finance department, while those for domestic trade, by the city of Kobe. The following is the general plan of the scheme to be carried out by the home department:—

Reclamation

Equipments for	Location.	Area.	Remarks.
Foreign-trade		90,747 *tsubo* (about)	Seafront of bund and No. 2 wharf
	Kaigan-Dori	11,147 „ „	
	Hamabe Dori	78,600 „ „	Seafront of Hamabo-dori
Home trade		91,628 „ „	
	Hyogo	81,600 „ „	
	Kaigan-Dori	10,028 „ „	Seafront of Hyogo
Total		182,375 „ „	Seafront of No. 3 wharf

Quays

Equipments for	Location.	Depth below Low water ft.	Length. Ken.	Accommodations.
Foreign trade			1,430.7	15 vessels of large and small size.
	Hamabe-Dori	33	1,430.7	
Home trade			1,670.0	22 vessels of large and small size.
	Hyogo	30	330.0	
	„	28	170.0	
	„	24	600.0	
	„	18	120.0	
	Kaigan-Dori	28	290.0	
	„	18	160.0	
Total			3,100.7	

Landing Places

Equipments for	Location.	Depth below Low water ft.	Length. Ken.
Foreign trade			873.0 (about)
	Kaigan-Dori	12	188.0
	„	9	297.0
	Hamabe-Dori	12	278.0
	„	9	110.0
Home trade			935.0
			935.0 (about)
	Hyogo	12	285.0
	„	9	650.0
Total			1,803.0

Breakwater

Classification.	Location.	Length. Ken.	Remarks.
For morings for foreign trade	Kaigan-Dori	100.0	For mooring of lighters
Total		100.0	
Kobe harbor	East breakwater (the work already commenced)	632.0	Completed except parapet wall
„ „	No. 1 East breakwater	600.0 (about)	Extension of east breakwater already started
„ „	No. 2 East breakwater	950.0	
„ „	South breakwater (the work already commenced)	500.0	Under construction
Total		2,682.0	

II

The following is the general plan of the improvements for foreign trade to be carried out by the Kobe branch of the construction section of the finance department. The work commenced in 1921 to be completed within twelve years.

Sheds.—There will be eight sheds erected on the moles which will be of two classes, i.e., ferro-concrete or steel according to the conditions of the ground upon which they will be built. Two of the sheds will be two storied with accommodations for passengers, while the others will be one storied structures built so that they can easily be increased to two storied if desired. The eight sheds along the lighter wharves to be of wooden.

The particulars of the sheds are as follows :

Sheds No.		Length.	Span.	
1	Ferro-concrete or steel	666 ft.	120 ft.	159,840 sq. ft.
2	,,	594 ,,	120 ,,	71,280 ,, ,,
3	,,	540 ,,	90 ,,	48,600 ,, ,,
4	,,	540 ,,	90 ,,	48,600 ,, ,,
5	,,	486 ,,	90 ,,	43,740 ,, ,,
6	,,	360 ,,	90 ,,	32,400 ,, ,,
7	,,	486 ,,	96 ,,	93,312 ,, ,,
8	,,	360 ,,	96 ,,	34,560 ,, ,,
9	Wooden	288 ,,	96 ,,	27,648 ,, ,,
10	,,	228 ,,	42 ,,	9,576 ,, ,,
11	,,	228 ,,	42 ,,	9,576 ,, ,,
12	,,	234 ,,	84 ,,	19,656 ,, ,,
13	,,	198 ,,	84 ,,	16,632 ,, ,,
14	,,	180 ,,	60 ,,	10,800 ,, ,,
15	,,	600 ,,	60 ,,	36,000 ,, ,,
16	,,	600 ,,	60 ,,	36,000 ,, ,,
	Ferro-concrete or steel shed.	8 ft.		532,332 sq. ft.
	Wooden sheds.	8 ,,		165,888 ,, ,,
			Total	698,220 ,, ,,

N.B.—The area 159,140 sq. ft. of No. 1 shed includes 79,920 sq. ft. second story.

The area 93,312 sq. ft. of No. 7 shed includes 46,656 sq. ft. second story.

The Main Building of Custom-House and Branch Office.—A three-storied building with a ground area of about 21,600 sq. ft. will be erected in the customs compound to be occupied by the Kobe custom-house and a two-storied office with a ground area of about 5,238 sq. ft. at the American hatoba as a customs inspection office. In addition there will be constructed, baggage examination offices, electric substation, passenger gang ways and other essential improvements.

Road and Railway.—There will be constructed three miles of pitch and asphalt roads, 12 to 30 feet wide, having granite pavements. The railway lines on each mole will connect with the trunk line at Onohama station. Many turntables, and scales for wagons will be installed. Wide gauge rails for the electric traveling cranes will be laid along the quays. The total length of rails, both for wagons and cranes, will be about 6.2 miles.

Cranes.—Eight sets of 1½ tons traveling electric cranes and four sets of five tons traveling electric cranes will be erected on the quays.

Electric Light, Water Supply, etc.—Electric lights will be placed along the roads of the new compound and inside the sheds. Water mains will be laid along the quay walls and hydrants will be installed throughout the compound for supplying vessels and for emergencies. Two powerful tug-boats for towing vessels alongside the quays will be provided.

The Expenditure

The expenditure for the works under the jurisdiction of the home department is estimated at Yen 31,770,000 of which Yen 11,000,000 is for foreign trade equipment, Yen 9,300,000 for domestic trade equipment, Yen 6,800,000 for the constructions of the breakwaters and Yen 4,670,000 for the construction of the breakwaters already started.

The total expenditure for the works under the jurisdiction of the finance department is estimated at Yen 9,500,000. Thus the total expenditure is Yen 41,270,000 of which Yen 16,450 will be borne by the city of Kobe.

Cut in Japan's Railway Estimates

The estimate for the special accounts of the imperial railway department for 1923-4 is now being compiled and it is believed that the department is facing difficulties in the work of compilation, says the *Osaka Mainichi*. It is understood that the department will have to cut the plans of new railway lines by 20 per cent.

The revenues of the department in April, May and June, from the passenger and freight services, showed some increase, but the rate of increase has been decreasing month by month. It is believed that it will be difficult to estimate the total revenues of the department over Yen 400,000,000, which was the estimate for the working budget for the present fiscal year. Even if a cut may be realized in expenditure by administrative readjustment, the net profits for the present fiscal year will not go beyond Yen 103,-000,000. Even should the surplus of this year be carried forward to next year, the amount would be very small.

Moreover, the finance office has requested that the policy of 25 per cent. "*tembiki shugi*" (stoppage at source) be carried out in the bond issue policy of Yen 80,000,000, of the railway department, i.e., to cut it down to Yen 60,000,000. If that cut be realized, the department will find it impossible to carry out even the already decided plans.

Claim of Department

The claim of the department, already approved, for the 1923-4 instalment, amount to Yen 195,950,000, including the estimate of 20 per cent. for the rise of prices. This amount can barely be met even if the bond policy of Yen 80,000,000 were altogether approved of by the finance office.

The department, however, is obliged to claim appropriations for a number of new railway lines, in deference to the railway construction law, passed by the 45th session of the diet. If nothing be done in that direction, the law will become a dead letter, thereby endorsing the views expressed in the house of peers, during the last session of the diet. Count Oki, the minister of railways, however, has declared in favor of carrying out the plans of the railway construction law, whereas Mr. Ishimaru, vice-minister, who has remained in office since the ministry, is responsible for the law.

As for the Seiyukai party, the question is one of the dignity and honor of the party, since that party had supported the construction law in the past.

Question of Electrification

There is further the question of electrification of railways, an appropriation for which needs to be asked for 1923-4. This item will call for Yen 60,000,000 and odd figures of expenditure for construction of railways, cars, generating and transforming stations. The expenditure for electric cars will amount to Yen 35,000,000 out of that total. Of the remaining Yen 30,000,000, there is an amount of about Yen 7,000,000 for the expenditure for electrifying the railway between Tokyo and Numazu, which had already been voted for before, leaving Yen 23,000,000 to be obtained anew.

If the work of electrification is to be completed in five years, the new annual instalment will amount to about Yen 4,000,000 or more.

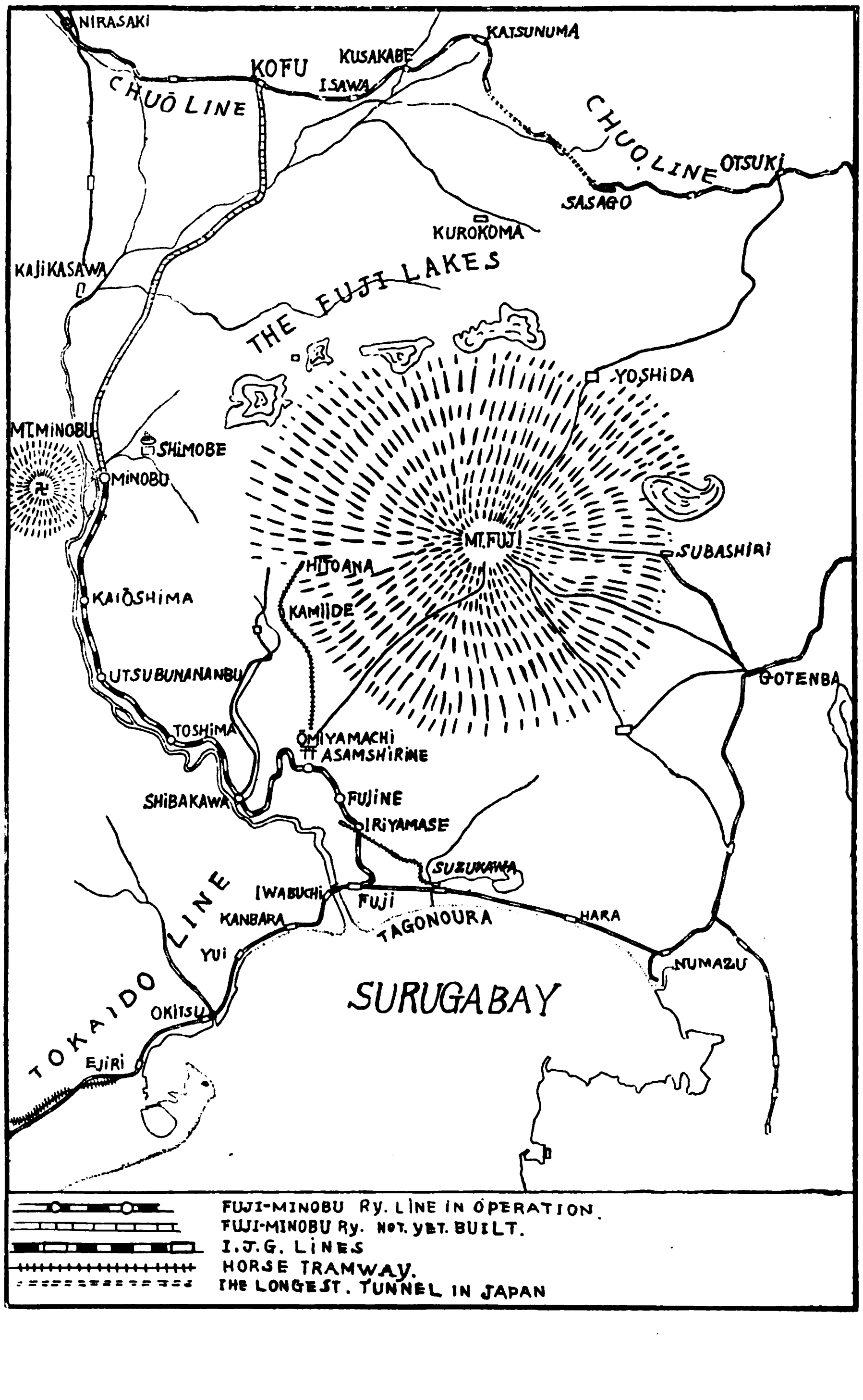
As to the new railway lines to be laid down, at an average of 40 miles of length per line, Yen 200,000 of expenditure per mile, a total of Yen 8,000,000 will be needed for completing one railway line. If ten lines are to be built, Yen 80,000,000 will be needed.

The Fuji-Minobu Railway Co.

Plans for its Electrification

THE Fuji-Minobu Railway Co., Ltd., was established in 1912, purchasing the line and equipment of the Fuji Tetsudo K. K., for Y.106,400. The new company at once began to improve the line between Fuji station on the Tokaido line of the imperial government railways, and Omita, the town of a distance of 6 miles and 32 chains. The gauge was changed to Japanese standard guage, 3 feet 6 inches, and the line opened to business on July, 20, 1913. At the same time a horse tramway was built between Suzukawa and Iriyamase, 69 chains.

In the first half of 1914, the company began construction of the line between Omiya and Minobu, under a guaranty from the Kounji temple on Minobu mountain, the chief temple of the Nichiren sect of Buddhism of an annual passenger traffic of 150,000 round trips for five years and agreed to pay any deficiencies in income, if the through passenger traffic failed to reach that figure.



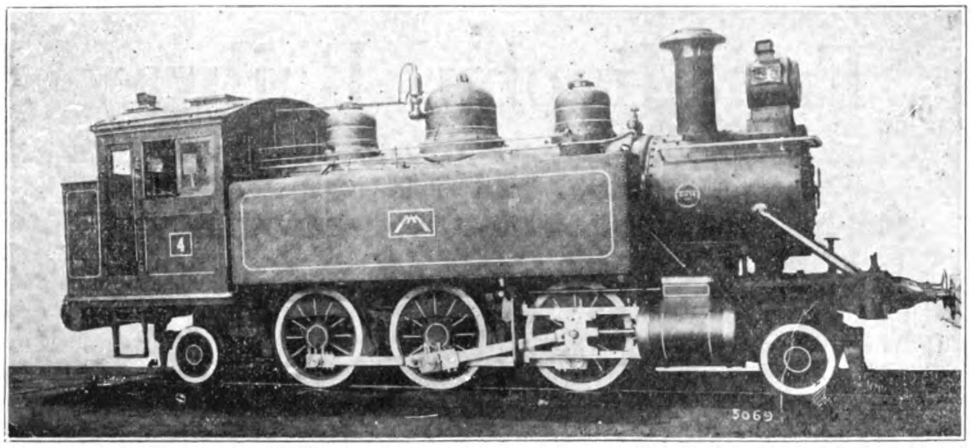
The section between Omiya and Shibakawa, 5 miles, 48 chains, was opened March 1, 1915. North of Shibakawa, the country is mountainous and very rocky and it took three years to complete the section between Omiya and Tashima, 4 miles, 32 chains, which was opened to business August 10, 1918. The remaining section between Omiya and Minobu were not completed till 1920, the total mileage being 26 miles, 79 chains.

Immediately upon the completion of the line to Minobu there was a rush to visit the Kounji shrine. During the first half of 1920 the number of passengers carried reached the highest figure in the history of the company, but owing to the financial depression there has since been a falling off in traffic. In 1921, the seven hundredth anniversary of the birth of Nichiren was celebrated at Minobu, but the occasion failed to attract a larger number of passengers than at the opening of the line. The number of through passengers increased and revenues were augmented by raising the passenger fares in April, 1920. The number of holiday-makers, however, is increasing especially climbers of Mt. Fuji. The younger generation is also studying the Nichiren doctrines, now popular because of the intensity of the nationalism preached by that sage.

The scenic beauty of the line attracts many passengers and a through traffic arrangement with the government's line at Fuji station, has materially augmented the number of passengers carried. Increase of business from year to year was largely the result of lengthening the line, but some of the company's prosperity was due to the general prosperity of the country. Consequently when the panic of 1920 wrought havoc in all classes of industry, the Fuji-Minobu Railway, also felt its effects in a decreased passenger and freight traffic.

As a general rule construction costs of mountain railways are extremely high and the Fuji-Minobu line is no exception to this rule. Furthermore, excursion lines have little, if any, freight traffic to decrease costs of operation per mile. The Fuji-Minobu line is primarily an excursion line, although it is doing a fine bit of pioneer work in opening up a new district for settlement and agricultural development through easy means of transportation. Between Fuji and Shibakawa costs of construction were quite normal, but between Shibakawa and Minobu, north of Shibakawa, the line runs through the mountains and costs of construction were extremely high. The company, therefore, charges a very high passenger fare.

Just before the line north of Shibakawa was opened to business, the imperial government railways raised all passenger fares on the plea that the cost of commodities had risen to such an extent that an increase in passenger fares was quite in order. Permission to raise rates was also extended to private railways, and the Fuji-Minobu line took advantage of this privilege, and raised the fare per mile to 5.5 sen, third class, for the Fuji Omiya section, while from Omiya to Minobu it is 1 sen higher per mile. Second class is twice the third class fare. In figuring freight rates the company was permitted on April 18, 1921, to estimate mileage at six times the actual distances. Consequently, freight rates are high.



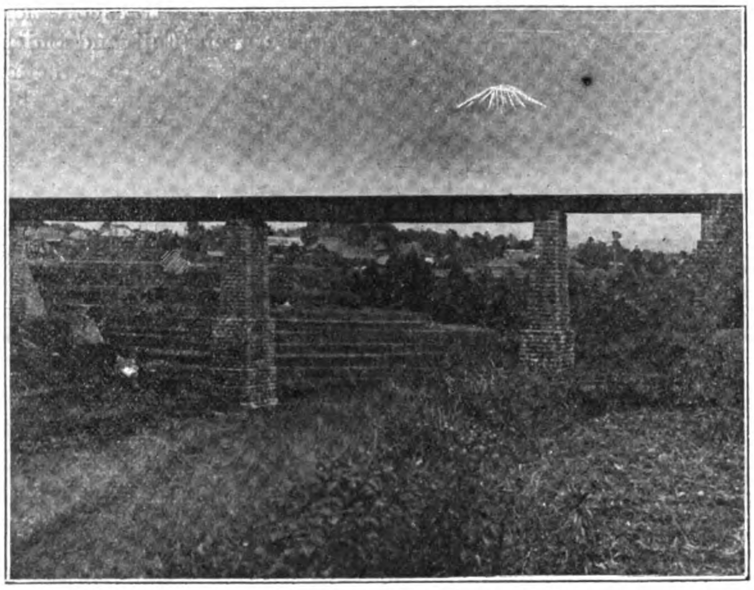
Baldwin Locomotive for the Fuji-Minobu Railway, Class 10-24-¼-D, 103 : Gauge 3-ft. 6-in. : Cylinders 15-in. by 20-in. : Total weight, 84,950-lbs.

Despite the advantages enjoyed by the company it has encountered many difficulties. Most of the construction was carried out at a time when prices were at their highest. Consequently the cost of construction per mile mounted higher and higher every year. The estimated cost of the 26 miles, 79 chains, between Fuji and Minobu, including stations, office buildings, etc., was Y.3,750,000, but by the end of 1920 they had reached Y.4,130,000 and at the end of 1921, Y.4,270,000.

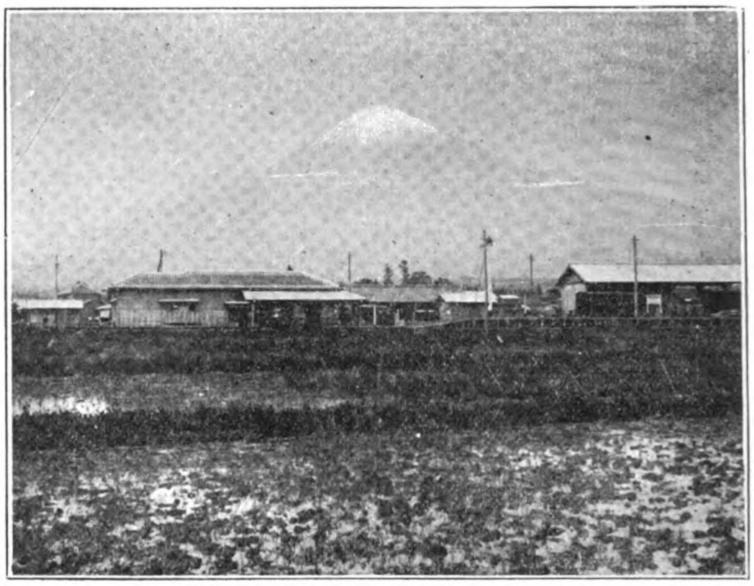
Owing to the rising costs of materials and the consequent expense of laying the line between Omiya and Minobu, a great part of the work was imperfectly done. Shortly after the line was opened to business in 1920, a severe typhoon did much damage to the line, necessitating a further outlay of Y.600,000. for reconstruction.

At such a cost it seems unprofitable to extend the line, but if the entire cost of construction to date is divided by the entire length of the line, it brings the cost per mile down to Y.154,500. This is a little more than twice the cost of the line between Fuji and Shibakawa and, considering the nature of the country, is not exorbitant.

When this railway was first opened to business the greater part ran through rice fields and freight was then the principal source of revenue, the Fuji Paper Mill Co., Ltd., being the principal shippers. This company now pay Y.20,000 a month in freights. Next comes the transport of logs and lumber. In order to increase the freight revenues, an extraordinary meeting of the shareholders was held in May, 1918, to approve the organization of a subsidiary company to engage in timbering, charcoal and acetic acid manufacture, together with afforestation along the line of the railway. Official permission was given for this enterprise and since 1920 the company has been actively engaged in cutting timber and preparing to manufacture charcoal. For this business during the second half of 1919, an expenditure of Y.34,304 was provided for, increased to Y.88,892 in the second half of 1921. The loans raised have been utilized for this enterprise.



Toyotsu River Bridge, Fuji-Minobu Railway



Omiya-Machi Station, Fuji-Minobu Railway

The cost of construction has gradually exceeded the paid-up capital and to meet its obligations the company issued long-term bonds for Y.2,000,000. The authorized capital is Y.4,000,000, of which only Y.3,200,000 is paid up. At the end of 1921 the legal reserve of the company amounted to Y.40,308.

If the cost of the line between Fuji and Shibakawa is deducted from the Y.4,270,000, it at once shows that the cost of the line between Shibakawa and Minobu is three tines more than that section. According to the company's business reports the value of the line and buildings, between Fuji and Shibakawa, was estimated as follows :

1916, December 31, at	Y.848,000
1917, June 30	851,000
1918, December 31	855,000
1918, December 31	857,000

The length of that section is 11 miles, 64 chains, so that the average construction cost per mile was between Y.72,500 and Y.72,600. But the cost of construction between Shibakawa and Minobu, including stations and office buildings, amounts to Y.3,500,000 in all, and as the line is 15 miles, 15 chains long, its construction costs per mile were more than Y.235,000.

Experience in Japan has shown that railway companies (such as the Fuji-Minobu), whose income depends more upon passenger traffic than on freight, make greater profits when electrified. During the war and in 1920, the price of coal was almost prohibitively high and has not yet come down to an economical level. With the idea, therefore, of electrification the company instituted an investigation into the cost and feasibility of the change. A report was made in 1921, which showed that great savings could be made by such a step, and in November 25, 1921, the railway department granted the license to make the change.

One of the great advantages of the Fuji-Minobu Railway is its close connection with the Fuji Hydro-Electric Co., Ltd., whose president is also head of the railway company. Power for operating the electric line can be obtained at very low rates from the

Fuji-Suiden, thus obviating the necessity of building expensive power plants.

After electrification, the number of stations along the line will be increased, in accordance with the plans to do everything possible to develop the district. With the increase of population along the line, the Fuji-Suiden will obtain new customers for light and power. So the future development of the Mt. Fuji districts depends in great measure on the co-operation of these two concerns.

The railway company holds a license to build a line between Minobu and Kofu, on the Chou line of the imperial government railways, a distance of 28 miles, 57 chains. When this extension is made the Fuji-Minobu railway will become an important connecting link between central Japan and the sea coast.

Unfortunately the company's application for permission to commence construction seems to be held up in the railway department, and construction is accordingly postponed. It is said that the railway department plans a line between the central line at Kofu and the Tokaido line at Iwabuchi, at the mouth of the Fuji River, to be commenced in 1923 and completed by 1928. The Fuji-Minobu license to build expires in 1926 and it is urged that the railway department sanction the immediate construction, of the Minobu-Kofu link, even though in the near future the line should become nationalized.

PRIVATE RAILWAYS IN JAPAN

A GOVERNMENT report just published shows 253 (private-owned railways in Japan, including 153 open lines on May 1, 1922, 109 with permission to survey, and 92 under construction or about to begin work. The total length of these railways was 4,771 miles and 57 chains ; in operation, 2,165 miles and 7 chains ; under construction, 1,066 miles and 50 chains, and licensed to survey, 1,549 miles.

The most noticeable tendency in railway construction is the growth of electric lines. Of the lines now in operation, 21 are electric, and 129 steam railways. The lines under construction include 23 electric and 68 steam, while those holding permission to survey include 37 electric and 64 steam railways.

Steam trains were exclusively operated over 1,822.5 miles of the lines now in operation. About 194.4 miles were electric, and 143.4 miles were used by both steam and electric cars. Considering that the number of such mixed power lines is only 7, this mileage is rather high.

The total capitalization of the 253 companies on May 1, 1922, was Y.678,082,427. Estimated costs of construction were Y.691,-873,283. Companies in operation were capitalized at Y.328,425,451, and their costs of construction had amounted to Y.196,227,721, on the date of the report. Lines under construction were capitalized at Y.79,726,976, and their estimated costs of construction until the completion of work were Y.112,082,143.

The estimated costs of construction of the lines licensed to survey are greater than the total costs of all lines now in operation and under construction. These lines include the ambitious underground railways for Tokyo. But their actual construction is extremely problematic, it having been found difficult to interest capital, either domestic or foreign, in these plans. Of the total estimated costs of Y.383,563,419, for all these lines, Y.159,000,000 is estimated for the four projected underground railways.

The following table gives details of all the lines now in operation, under construction, or licensed to survey :—

JAPAN'S PRIVATE RAILWAYS, MAY 1, 1922

Power	Number	Mileage	Capital	Costs of Construction, actual and estimated
Steam	191	3,637.06	Y.338,282,427	Y.318,788,131
Electric	62	895.56	197,240,000	181,858,690
Electric cable	9	7.32	5,400,000	2,353,337
Electric underground ..	4	44.75	97,000,000	159,000,000
Electric and steam ..	9	175.37	35,590,000	29,248.125
Gasoline	2	8.27	570,000	570,000
Human power	1	2.64	—	55,000
Total	253	4,771.57	Y678,082,427	Y691,873,283

Licensed Railway Construction

The Yamato Tetsudo K.K. (Yamato Railway Co., Ltd.) in Nara prefecture, obtained on June 7, 1922, official permission to extend its line from Sakurai-machi, Isoki-gun, Nara prefecture, to Nahari-machi, Naka-gun, Mie prefecture, 17 miles, 40 chains ; gauge, 3 feet 6 inches ; electric power. The cost of construction is estimated at Y.3,000,000. The present line in operation is from Tawara Moto, to Shinnoji, in Nara prefecture, 6.3 miles, steam cars. The weight of rails used is 45 pounds.

Government Railways to Complete Double Tracking

During the fiscal year 1922-1923, the Imperial Government Railways will double 100 miles of track. Next to the main line, between Tokyo and Kobe, the busiest section, is the Sanyo line, between Kobe and Shimonoseki. This line, between Kobe and Waki, 71.4 miles, is now double tracked. At a cost of Y.5,000,000 this line is now being doubled in the neighborhood of Wakayama, so that between Kobe and Wakayama all will be double tracked before the end of 1922. The whole line between Kobe and Shimonoseki is to be doubled by the end of 1928, but using certain other appropriations it will be completed by the beginning of 1927.

Electric Machinery Makers Combine

UNDER the mediation of Mr. M. Ota, the managing director of the Keihan Electric Tramway Company, the amalgamation of the Kawakita and Toyo Electric Machinery Companies is reported to be steadily progressing. The amalgamation of electric machinery companies has been planned several times, but in vain. Just after the commercial depression set in, Mr. M. Fukuzawa. then, the president of the Nagoya Electric Lighting Company, induced the Kawakita and the Osaka Electric Machinery companies and the machine manufacturing department of the Osaka Electric Lighting Company of that city together with the Okumura Company of Kyoto to consolidate and the plan progressed as to investigating the assets and liabilities of each company, but failed because the Kawakita asserted a desire to secure the sole selling right of the new consolidated Company's products.

Immediately after that, the three Companies excluding the Kawakita, induced the Hitachi Electric Machine Manufacturing Works and tried to form a consolidated company great enough to compete with the Shibaura Works of Tokyo, but the plan failed also owing to the opposition of the creditors of the Okumura Electric Machine Company.

After that no serious attempt at amalgamation has been made, the market being left open for competition among the companies. The Toyo Electric Machinery Works, which is to amalgamate now with the Kawakita, has its head office in Tokyo and is manufacturing motors and other electric tram and steam locomotive machinery.

No. 3 Mill of the Fuji Paper Mill Co., Ltd. in Shidzuoka Prefecture

Paper Making in Japan

The first part of this article is from the Annual Number of the "Paper Trade Journal"; the rest compiled from official sources

THE manufacture of paper in Japan was started in the year of 1873 and since then its progress has been very slow, being influenced by the undeveloped state of Japanese finance and culture in general, which naturally required a limited amount of paper. However, in the year of 1890, one of the promoters of the Fuji Paper Manufacturing Company which is now regarded one of the largest of its kind in the east, was despatched to Europe to study the process of manufacturing paper from woods and on his return a factory was established at the foot of Mt. Fuji. At the time, only one machine was run in making paper, the output of which was sufficient to cover the entire demand of all the news publishers in Japan, and leave a surplus of 30 to 40 per cent. According to what the records tell us, that surplus was a hard knot to dispose of. Since then, the industry has made a rapid progress. But at the time of the Russo-Japanese war, the expense of producing paper in Japan was so great as compared with that in America, Sweden and Norway, that paper manufactured in those countries was cheaper, even with freight and duty added.

In the year 1906 just after the Russo-Japanese war, Japan began utilizing woods produced in Hokkaido, north extremity of Japan, in making paper. Woods in Japan proper are generally regarded unsuitable for the purpose because of poor quality and comparatively high price. "Ezo Pine," or Abies Sachlinensis, coniferous class of woods, or those produced in the north of the 47th degree of latitude are considered the best for paper making. Woods produced in Karafuto—formerly called "Sakhalin"—a small isle lying north of the Hokkaido and those on the "Coast Province" of Eastern Siberia are also considered adaptable.

At that time even the most skilled workman was able to produce only 200-ft- a minute with a machine 75.6-in. wide which was the largest in Japan then.

Beginning of a New Era

In August, 1921, however, the Fuji Paper Mills installed in their Hokkaido plant a machine 186-in., wide. This machine was started in November, producing at the rate of 800-ft. a minute a speed four times as great as the first machine mentioned. This clearly indicates the rapid progress Japan has made in recent years. At present, Norway and Sweden are very skilful in making the thinnest paper, while America makes it a distinctive feature to produce the thick paper most quickly, therefore Japan, after making elaborate efforts and taking into consideration the strong points of those countries, is now making news print of substance between America and Sweden. Further she is doing her best to make paper at as cheap a rate of production as possible, by producing a large amount of paper with as little material as possible. Formerly, materials were brought to the paper factories on workmen's shoulders or on carts and when paper was required to be reeled on roll, such paper had to be sent on to another factory for the purpose, but the present arrangement, requiring no workmen's hands and depending upon the action of machineries exclusively, it is no exaggeration to say that Japan is in no wise inferior to those countries in process of manufacture as in cost of production. While paper manufacturers in general are paying much attention to producing paper at the lowest rate of expense, they are endeavoring not to give the slightest uneasiness to employees. Therefore, even in time of depression in the year of 1920 they never cut down wages, but instead raised them twice, in February and August 1921. In other words, they make it a point to give better wages but not to employ so many workmen.

Making New Varieties of Paper

Prior to the European war, Japan preferred to make paper that required little trouble or the so-called "cheap class of paper." This was owing to the inferiority of technique when they manufacture any different kinds of paper or thinner ones, inferior qualities were turned out at a high cost of expense. As a result, paper thus produced was sold at less price than it cost. While other countries were making different weights of paper at comparatively cheap cost during the war-time such paper was not imported to Japan in large quantity, therefore being pressed by the keen demands in the

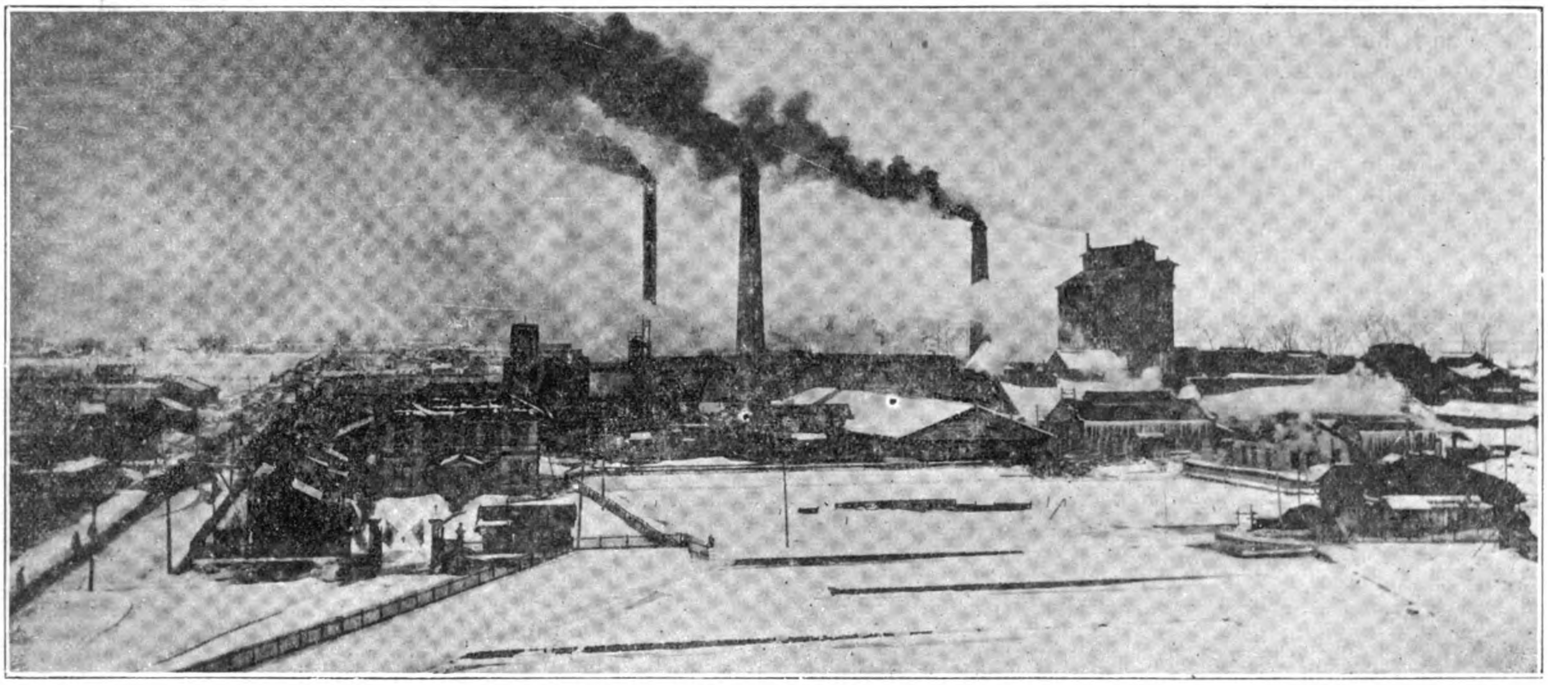
home market, various weights of paper had to be manufactured, which was sold at high prices. This was a unique experience for paper manufacturers in Japan. They did not lose money, but rather profited and now Japan can make any grade of paper from woods, straw, rags of qualities not at all inferior to those manufactured in other countries. However, there is one variety in which she is behind America and Europe viz., packing (wrapping) paper. This is because Japan is now using common sulphite-pulp and not using kraft-pulp, which would cause high cost of production. This leads her to hesitate about packing paper at present. In Sweden and Norway, the process of making this grade of paper, has been greatly improved. With a view to following this process, Japan sent a few people to these countries to study it a year ago and expects their return very soon. When this process is mastered Japan may be said not to be behind any paper making country in the world.

Paper Manufacturers' Association Formed

In Japan, leading paper manufacturers organized the Paper Manufacturers' Association some time ago with the idea of improving the art, fixing selling prices, etc. Prices of paper were at high level up until the middle of April, 1920, when the paper market in the city became demoralized. Generally speaking, in the months of June, July, August, demands for paper are always less simply because of the short-nights which naturally afford not much time for reading papers, magazines, etc. The months of September to November are called the reading season, when demands are largest of the year. Therefore all manufacturers expect an unusually big demand in the month of September. But anticipated sales did not materialize and therefore the Paper Manufacturing Association decided to limit output by 20 per cent. in the latter part of December, 1920. Why had they taken such a step ? Prices of commodities were declining all over the world and if the matter were left alone, the paper market in Japan would be thrown into a chaotic condition rapidly, therefore the limitation system was taken up in order to lower the prices of paper gradually. If prices of paper were forced down at a bound, paper dealers as well as manufacturers themselves would naturally suffer from the financial operation, in view of which manufacturers gave as much accommodation as possible in every respect to leading paper dealers, lowering prices very gradually. As a consequence, at the end of October, 1921, stock of paper decreased as greatly as 40 per cent. when there arose a question about withdrawing the limitation of output, and it is possible that this may be done soon. Be that as it may, the Paper Manufacturers' Association is indispensable for the promotion of the paper business in Japan, in view of the fact that through the association the paper market in Japan had not been thrown into confused state by the worldly depression.

Amount of Paper Manufactured

As regards the amount of paper manufactured in Japan—that is paper manufactured by members of Paper Manufacturers' Association—the appended list will explain all details. Needless to say that list does not include the manufacture of so called Japanese paper, such as tissue, Torinoko, and strawboard paper. According to the investigation made public recently, the total of paper Japan consumes in one year would amount to 700,000,000 pounds. If this figure be apportioned to Japan's population, it amounts to 12 pounds per head per year and according to what we learn about foreign countries, in the year 1918, France is said to have consumed 48 pounds, British Empire 50 to 55 pounds, the United States of America 58 pounds, while China consumed only 2 pounds. Speaking about prior to the European war, European Russia consumed 22 pounds per head, Asia-Russia 7 pounds, while Japan consumed about 10 pounds. What surprises us most is that the consumption of the United States of America in the year 1920 was figured at 112 pounds per head. From the above, Japan seems far behind the advanced countries, while it is specially amazing to note the rapid progress the United States of America has made in recent years.



The Ebetso Mill of the Fuji Paper Mill Co., Ltd., in the Hokkaido

Demand for Paper Increasing

Demand for paper in Japan is increasing at the rate of over 10 per cent. per year. While at present, the supply of paper seems not to equal the demand after two years it is obvious that demand will make such increase that supply will become short. Notwithstanding this, Japan proper or even Hokkaido are no longer in a position to meet such increasing demands, but they may be met by Karafuto. Fortunately, during the European war, three pulp-factories were established in Karafuto the output of which will amount to about 80,000 tons per year. This 80,000 tons not being sufficient to meet the home demand, Japan is now importing about 50,000 tons of pulp from overseas countries. Therefore every endeavor is being made for additional pulp-factories in Karafuto. The factories at present are established near the seashore for shipping facilities, but in the inner part of the island, there are many

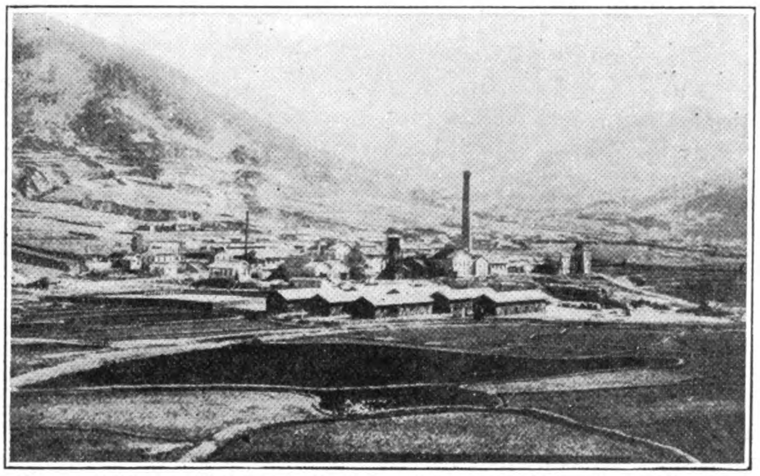
good forests untouched and before long the forest-railways are to be built to reach there. Also there are many good forests on the cost province of eastern Russia with abundant coniferous woods, in which some members of the Paper Manufacturers' Association have already invested capital as the reports put it.

News Print First in Demand

Among papers of various kinds, news print stands first in demand and improvement. In the year 1916, the largest publishers in Japan could only issue 200,000 per day, while to-day some news publishers issue something above 600,000 per day. If, therefore, the improvement continues to such a degree, the news publishers will naturally get their supplies from overseas if the expectation of manufacturing enlargements in Japan are not realized within a few years.

During the war time, Japan had 29 strawboard factories all of which possessed the up-to-date machinery, but at present only 8 factories are run. This, needless to say, is caused by the world-wide depression.

As is shown on the attached list, total amount of paper manufactured declared by the Paper Manufacturers' Association was put at 129,000,000 pounds in 1904, and it increased to 230,000,000 pounds in 1911, and to 559,000,000 pounds in 1920. This 559,000,000 pounds shows an increase of four times as much compared with that of 1904, within 16 years. October, 1921, showed an output of 45,000,000 pounds a month to which 20 per cent. limitation being added, it represents 54,000,000 pounds monthly or 600,000,000 pounds per year. That is to say, the last figure will indicate an increase of 13.3 per cent. per year since 1904.



Plant of Chosen Pulp Manufacturing Company, Kiho, South Keisho Province

PAPER MANUFACTURED, EXPORTED AND IMPORTED

Years	Amount Manufactured, lbs.	Amount Imported, lbs.	Amount Exported, lbs.
1904.. ..	129,215,000	34,046,000	11,014,000
1905.. ..	134,441,000	76,336,000	11,042,000
1906.. ..	132,432,000	79,257,000	19,396,000
1907.. ..	147,296,000	89,890,000	14,044,000
1908.. ..	148,647,000	65,052,000	9,788,000
1909.. ..	162,104,600	90,925,000	7,073,000
1910.. ..	191,591,000	92,823,000	14,247,000
1911.. ..	228,163,000	74,002,000	9,566,000
1912.. ..	251,337,000	77,214,000	13,462,000
1913.. ..	295,893,000	80,038,000	794,000
1914.. ..	327,614,000	54,190,000	14,406,000
1915.. ..	367,579,000	27,068,000	26,937,000
1916.. ..	405,468,000	35,694,000	55,427,000
1917.. ..	455,000,000	16,637,000	69,485,000
1918.. ..	498,965,000	34,277,000	72,815,000
1919.. ...	519,142,000	·56,303,000	66,352,000
1920.. ..	559,835,000	56,879,000	51,049,000

Not including straw board.

There are many paper manufacturing companies in Japan, the greater number of whom belong to the Paper Manufacturers' Union. These companies consume on an average some 150,000 tons of pulp in a year, of which mechanical pulp amounts to about 70,000 tons, and is supplied from home sources, while chemical pulp—80,000 tons—comes as to half from abroad, 30,000 tons from Hokkaido, and 10,000 from Karafuto.

The following table gives the production of foreign paper by the members of the Paper Manufacturers' Union in 1919 :—

Manufacturer.	Output for 1919. lbs.
Oji Paper Mill	192,222,621
Fuji Paper Mill	144,208,932
Mitsui Bishi Paper Mill	51,076,880
Kyushu Paper Mill	28,513,622
Kokura Paper Mill	20,446,684
Yokkaichi Paper Mill	17,927,951
Kiso Industrial Co.	15,843,796
Central Paper Mill	14,365,566
Tokyo Pasteboard Mill (excluding pasteboard)	12,979,192
Hokuyetsu Paper Mill (excluding pasteboard)	6,265,745
Kumano Paper Mill	4,004,649
Umedzu Paper Mill	3,904,710
Naknoshima Paper Mill	3,649,736
Yukosha Paper Mill	2,378,859
Total	517,788,943

Of this total, newsprint accounted for 229,761,192-lbs.; common printing paper for 81,985,399-lbs ; fine printing paper for 72,736,622-lbs.; and packing paper for 23,560,728-lbs. The total manufacture of 519 million pounds odd compares with 499 millions in 1918 and is no less than 192 millions greater than the Union's production in 1914.

As regards exports in 1919, printing paper totaled 29,082,000-lbs., valued at Y.6,461,332 ; and pasteboard 29,526,000-lbs., valued at Y.2,900,803. The total exports were valued at Y.33,340,277. The principal customers were China, Y.10,273,758 ; Kwangtung Province, Y.4,744,544 ; Asiatic Russia, Y.3,304,617 ; Hongkong, Y.1,970,845 ; and India, Y.1,390,970.

The Japanese Paper Market

Since the war the United States, in marketing paper in Japan, has met with exceedingly keen competition. As a result the American position in the Japanese paper import trade has suffered conspicuously during the last two years. In the following table is shown the recent decline in importance of the United States as a source of paper for Japan compared with Great Britain and other countries :

Country.	1919	1920	1921
	Yen.	*Yen.*	*Yen.*
Great Britain	1,690,948	3,614,170	2,125,073
United States	15,678,018	8,770,118	4,196,360
Other countries ..	1,017,926	5,023,982	6,053,298

Note.—One yen equals about 50 cents.

Competition Affecting American Paper Exports

This remarkable decrease in the proportion of the trade held by the United States is due to the return of Scandinavian and German competition. At the present time Americans generally are out of the market, except in certain lines, such as bond and ledger paper. European competiton is extremely keen, and European manufacturers are now able to offer goods at lower prices than can American manufacturers.

The figures below show the imports of various kinds of paper into Japan in the year 1921 :

Paper imports into Japan, 1921.

Kinds of paper.	1921 Pounds.	Value.
Printing paper :		
Weighing not more than 58 grams per square meter	6,346,266	$444,808
Other	14,588,933	1,764,213
Writing paper	1,700,000	329,709
Packing paper and match paper ..	18,995,733	1,932,018
Pasteboard and cardboard	2,464,133	363,162
Tissue paper	1,813,733	264,404
Imitation parchment, paraffin paper and waxed paper	2,238,933	470,772
Other papers :		
Fancy paper	1,270,400	228,675
Other	..	389,620

The imports in the year 1921 were approximately the same in volume as in other years since the war, but are nearly double those of pre-war years. The principal market for printing paper is Tokyo, the center of the printing industry of Japan, while the principal market for packing paper, cardboard and other industrial papers is Osaka, the industrial center of the country.

Newsprint and Other Papers

Japan is now able to supply almost the entire domestic demand for newsprint, using pulp, a part of which is made in the Hokkaido and a part of which is imported from Canada and Sweden. However, the cost of production in Japan is so high that European (especially German) paper mills can compete. The Japanese mills have been restricting production, with the hope of artificially holding up prices, but this has not succeeded owing to the arrival of newsprint from abroad. American newsprint is practically out of the market, owing to the high prices asked.

Kraft paper, formerly imported from the United States in large quantities, is now coming from Europe and Canada. Waxed paper, glassine, and similar papers, which are used in considerable quantities in the local confectionery and other trades and which were formerly imported from the United States, are now being sold here by German mills at prices at which American mills can not compete. Large quantities of cardboard are being supplied by Canadian mills, whose prices are lower than those of American mills. High-grade glazed paper and cardboard for lithography and color printing are now coming from Germany and Sweden.

The American mills still appear to be able to compete in bond, ledger, writing and other high-grade papers, but European competition makes itself felt.

Pulp Industry of Chosen

The preparation of pulp and pulp wood, like most other mechanical industries in Chosen (Korea), is still in its infancy. The supply of pulp wood is considerable. According to official estimates, there are 13,290,000 acres of forests with trees suitable for pulp wood, mostly along the Yalu and the Tumen Rivers, with an average yield of 8.1 cords per acre. The quantity of spruce and fir available is estimated at 34,751,343 cords. Pulp is also made of a certain variety of reed growing in the marshy river bottoms. All but one of the 23 firms engaged in the preparation of pulp wood are Japanese, employing altogether 940 hands (Chinese and Korean). Their total annual output of pulp wood is 39,000 cords.

There is but one modern pulp mill, with a capacity of 15,000 tons per annum. This mill is situated on the Yalu River and is controlled by the Oji Paper Mills, of Tokyo. The quantity exported in 1920 was 9,208tons, most of which was shipped to Japan.

(Ta be concluded in next issue)

Osaka Public Works for 1923

Waterworks

ONE of the urgent matters before the Osaka municipality is the extension of the water mains. During 1922, 168,990 feet of new mains will be laid and 62,970 feet renewed. During 1923, a new water main to a new district recently opened in the western part of Osaka will be laid. Also, a great deal of pipe will be taken up and relaid as part of the necessary work accompanying the widening of the city's streets. Several other plans which affect the water bureau involve a much larger expenditure during 1923 than in 1922, for which Y.523,000 has been provided. Income from water supplied in 1922 is estimated at Y4,326,000, with an increase of 5 per cent. for 1923.

Drain Improvement

Work is now being carried on for the extension of gutters. This program will take three years to complete and the expense will be met by a loan for Y.4,600,000, recently approved by the municipality, of this, Y.1,850,000 will be expended in 1922 and 1923, and Y. 900,000 in 1924. During the present year the Ichioka Izuo and Sangenya districts will be completed, and in 1923 work will be started upon the streets in the newly opened districts of the city.

Electric Railways

The municipal railways are planning many extensions. A new workshop, No. 2 Kujo power plant, a hospital for railway employees, and reconstruction of the transformer station are the most important projects which the electric railway bureau now have in hand. All this work will be completed in 1922, with the exception of the reconstruction of the transformer station, which will be continued into 1923.

The principal equipment additions for 1923 will be the construction of 66 new tram cars and certain extensions of the line which must be carried out as a result of the widening of city roads. The lines in operation will be extended thirteen miles and part of this mileage will be completed in 1923. To meet the expenses, it is expected that a considerable increase in next year's budget will be made.

Road Construction

A sum of Y.8,000,000 to be used for road construction was carried forward from 1921 to 1922, and it is reported that this amount will be spent in purchasing land necessary to improve the following important roads :—

Kami Honcho, 6 chome, to Tamatsukuri, passing through Kasumicho : Nihonbashi, 3 chome, to Ebisu-machi :

A Road between the main road to Nara and Tamatsukuri Kasumicho. Sotoya-cho, 3 chome, to Ote Dori, Kyobashi.

The purchase of land has been going on for some time and the work of construction between Tami-machi and Kyobashi is to commence soon.

Road construction for 1922 will be carried out with funds from the special city tax which will amount to Y.4,000,000. The imperial sanction for floating city loans to meet road construction expenses not having been obtained. Projected work for 1923 includes widening a number of old roads and the construction of several warehouses for the storing of machines and tools.

Electric Tramway for Pyongyang

A despatch from Pyongyang,Korea,reports that the construction of an electric tramway there was sanctioned on July 3. The work will be started as soon as possible and is expected to be completed in the course of March next year. A double line will be laid on the streets between the railway station and Shinson (Sinchangli), two miles in length. There will be twelve stops and the line be divided into two sections, the fare for one section being 5 *sen*. Ten cars will be used.

Electrical Developments in Japan

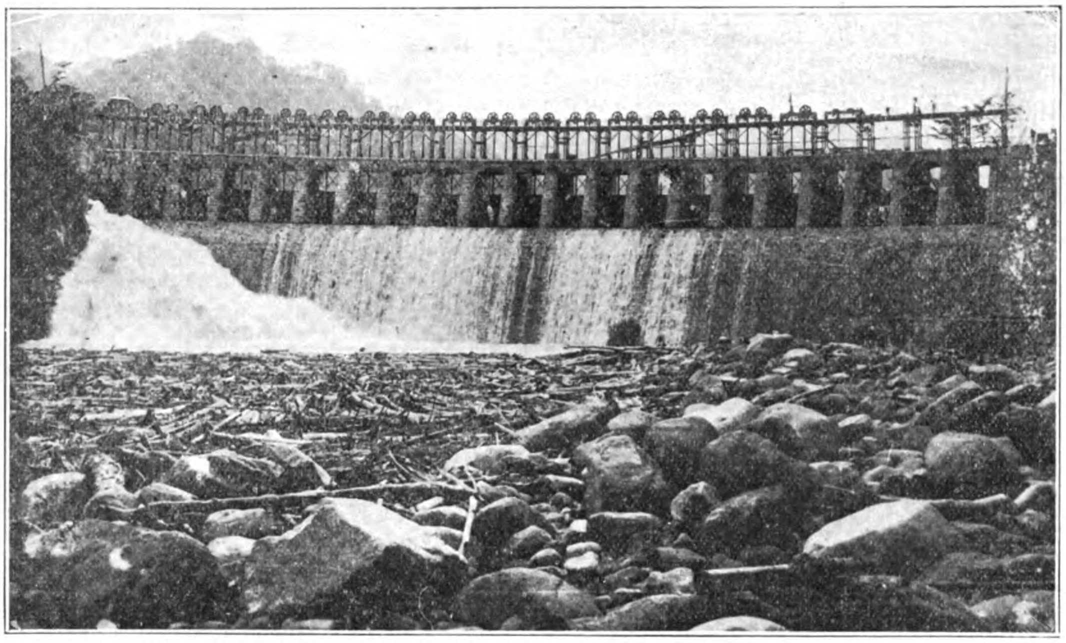
The Kansai Denki Kabushiki Kaisha

SINCE Japan entered a period of industrial re-organization, there have been many electric companies which have amalgamated their interests. The Kansai Denki K.K. was the first company to effect these amalgamations, and it has now the greatest number of other companies absorbed in its organization.

The Kansai Denki Kabushiki Ksiaha is the name of the amalgamated interests of the Kansai Suiryoku Denki K.K. and the Nagoya Dento K.K. Contrary to the usual methods of such amalgamations the Kansai Suiryoku Denki K.K., capitalized at only Y. 4,500,000, absorbed the Nagoya Dento K.K., capitalized at Y.48,487,000.

Between the Kansai Suiryoku and the Nagoya Dento there was a great difference in the value of their properties and also in the market value of their shares. On amalgamating, therefore, the value of the Nagoya Dento was estimated at Y.16,160,000 more than the value of its outstanding share issues and the amalgamated capital of the two companies was fixed at Y.69,149,000. The shareholders of the old Nagoya Dento received four shares of the Kansai Denki K.K. stock for every three of their own shares held at the time of amalgamation.

Of the combined capital (Y.69,149,000) that of the Kansai Suiryoku Denki K.K. was only Y.4,500,000, the rest represent the value of the properties of the Nagoya Dento K.K. The activities of the new company is centered around the operations of the old Nagoya Dento.



Dam of the Kinugawa Hydro-Electric Co., at Kurobe, Tochigi Prefecture

Prior to the amalgamation effected on October 18, 1921, the Nagoya Dento had absorbed the Gifu Denki K.K., the Toyohashi Denki K.K., the Itatorigawa Denki K.K., the Okita Denki K.K., and the Mino Denka K.K. (Mino Electro-Chemical Co., Ltd.). In effecting these combinations with its own interests the Nagoya Dento allowed increased estimates of value to the Toyohashi Denki K.K., the Gifu Denki K.K. and the Okita Denki K.K., while it accepted at slight under-valuations the property of the Itatorigawa Denki K.K. and the Mino Denka K.K.

In effecting these amalgamations the Nagoya Dento increased its capital by Y.14,737,000, of which Y.9,180,000 was paid up. Of this increased amount, something like Y.2,700,000 was based on the increased valuations allowed for the properties of the three companies. This increase, however, had no ill-effects on the Nagoya Dento whose operations thereafter proved the value of its procedure.

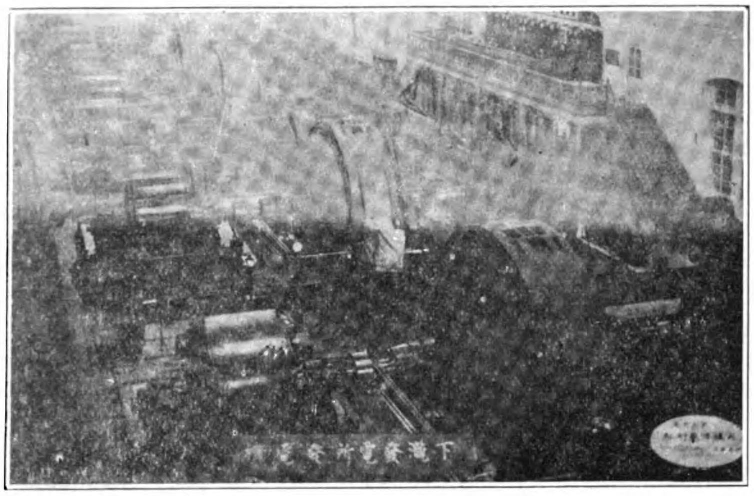
With the amalgamation of the Kansai Suiryoku Denki K.K., the property of the Nagoya Dento was overvalued by Y.16,160,000, about one-third of the total capital. There now exists a fairly big difference between the value of the property of the former Nagoya Dento and its properties in the amalgamation with the Kansai Suiryoku.

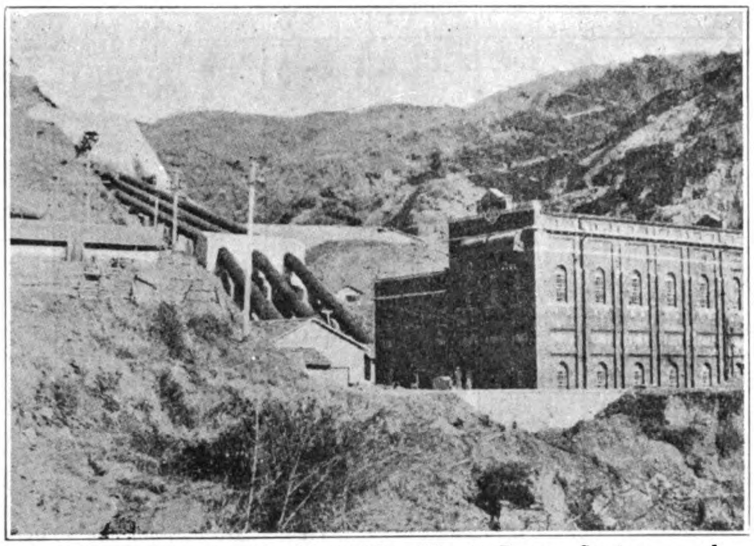
Since the completion of the merger in October last year, the Kansai Denki K.K. has absorbed the Chita Denki K.K. and the Tenryugawa Suiryoku Denki K.K. It is also announced that negotiations are now under way with the Yamashiro Suiryoku Denki K.K., the Hokusei Denki K.K., the Aiki Denki K.K., the Toki Suiryoku Denki K. K., the Kyushu Dento Tetsudo K.K., the Yawata Suiryoku Denki K.K., the Bishu Denki K.K. and the Nagoya Gasu K.K., having for their purpose the close co-operation, or eventual amalgamation into one organization of all these interests.

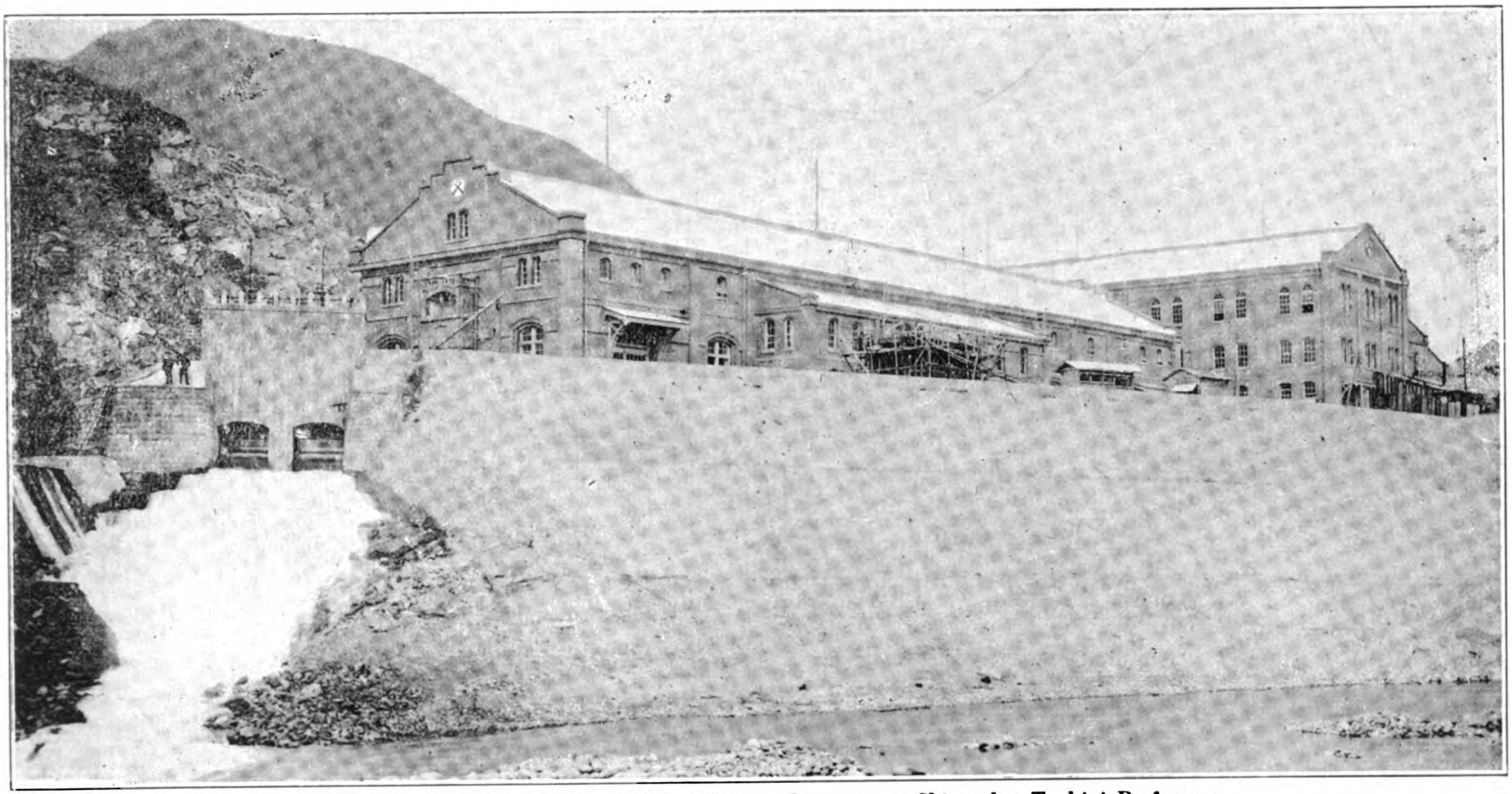
After absorbing the Chita Denki K.K. and the Hokusei Denki K.K., the Yawata Suiryoku Denki K.K. and the Bishu Denki K.K., the company will have increased its capital to Y.139,800,000, of which Y.99,990,000 will be paid up. It is evident that the properties of these four companies have been much overvalued, for the purpose of the amalgamation, the most ambitious of its kind in Japan to-day. After this capital increase is effected, the Kansai Denki K.K., will rank next in importance to the Tokyo Dento K.K., Japan's premier electric company. Comparing the proposed capital, of this combine with that of the Nagoya Dento in January, 1921 (Y.33,750,000, of which Y.21,000,000, only was paid up), the increase during the past eighteen months has been remarkable, almost Y.110,000,000. Such a rapid expansion of capital is unique in the history of Japanese industries.

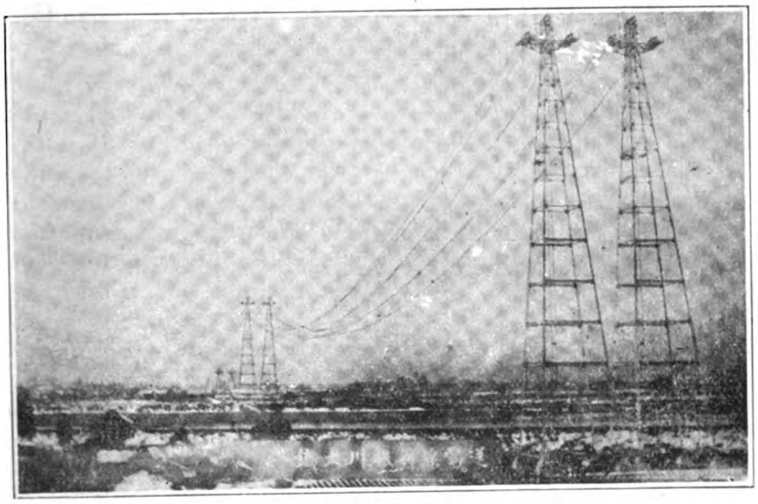
As a result of all these mergers the Kansai Denki K.K., has added to the scope of its operations an electric railway, a gas plant and a factory for producing chemicals by electric processes. In the days of the Nagoya Dento its whole business was the supply of power. The area of its operations has, as a matter of course, expanded. They now cover the cities of Gifu, Toyohashi, Hamamatsu and Ise, in Yamato, but Nagoya still remains the centre of its business. It has also commenced to expand its operations in an entirely new field, the south of Japan, where it now owns properties covering the cities of Fukuoka, Sasebo, Nagasaki and Shimonoseki. In all, its business in both districts covers 16 cities, 101 towns and 567 villages. Only one company in Japan the Tokyo Dento covers a larger area.

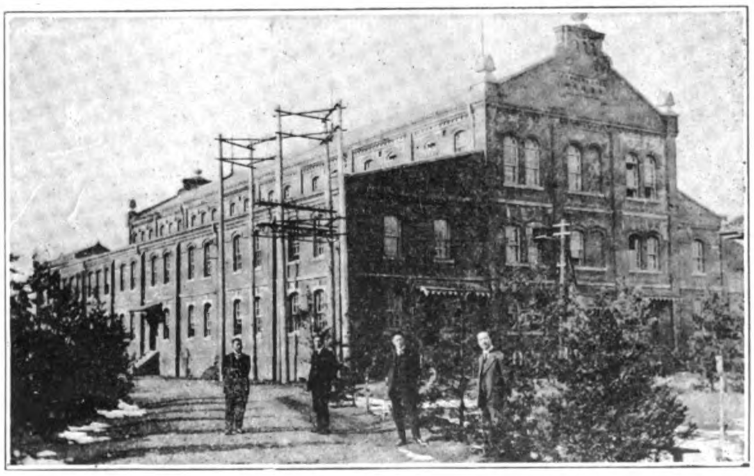
It is important to give some attention to the business of the Nagoya Dento in order to understand the present condition of the Kansai Denki.

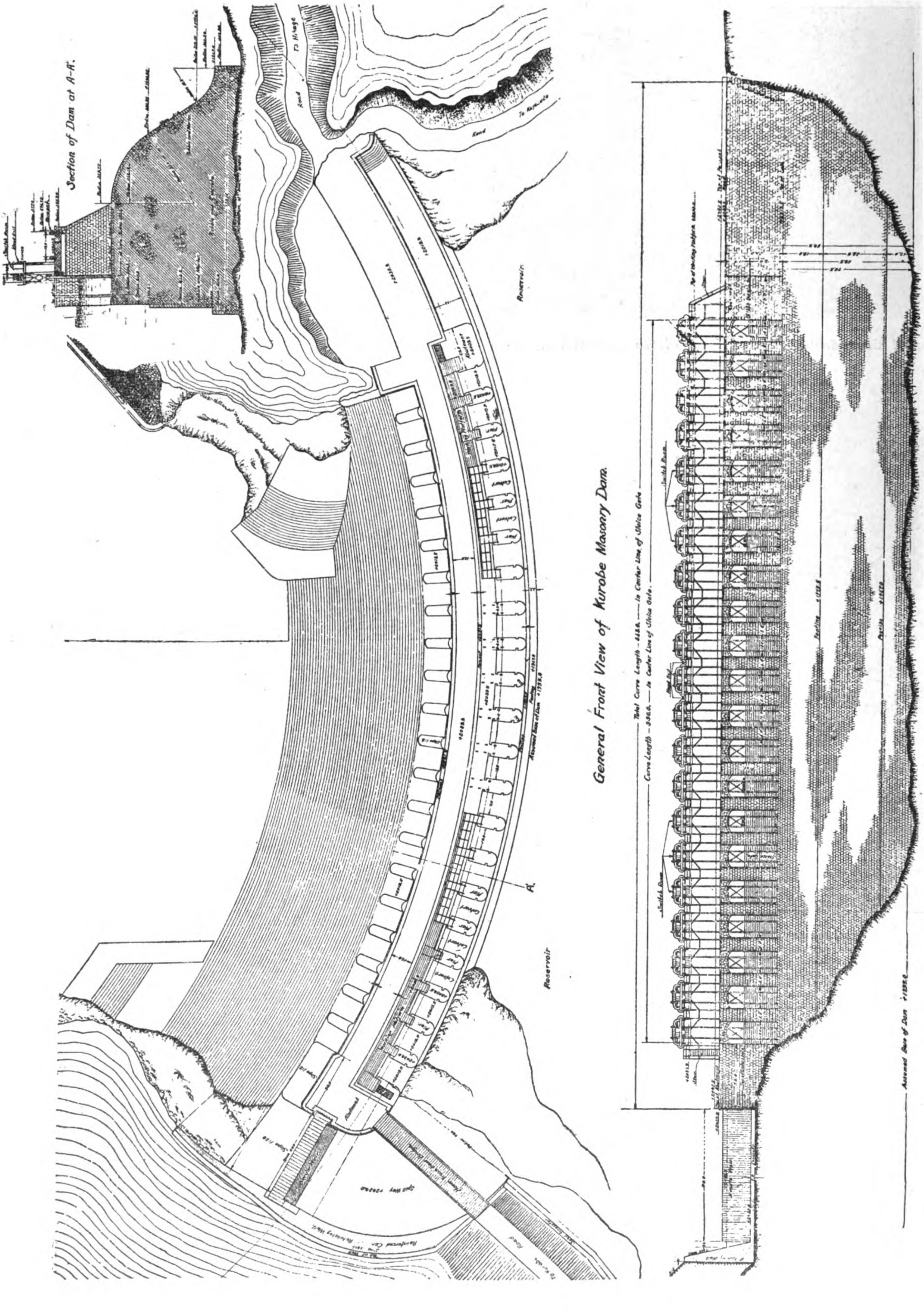

Interior of the Shinotake Power House of the Kinugawa Hydro-Electric Company


Wakayama Suiryoku Denki Kaisha, No. 2 Power Station on the Hidaka-Gawa

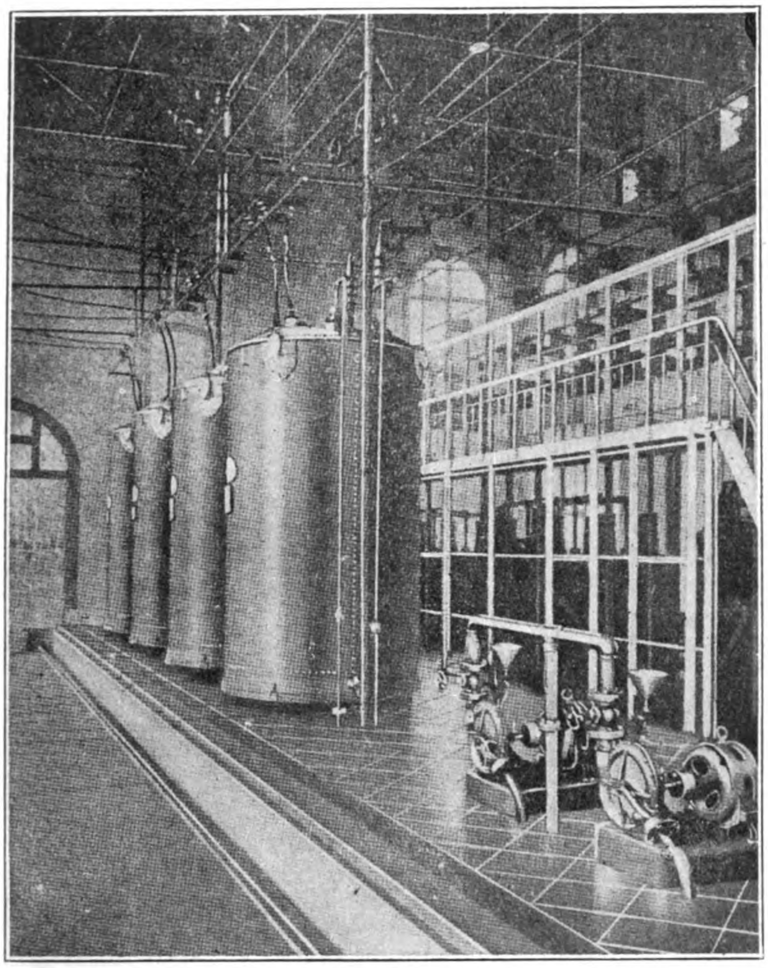

Power House of the Kinugawa Hydro-Electric Company at Shinotake, Tochigi Prefecture


Transmission Tower of the Kinugawa Hydro-Electric Company Crossing the Tone River


Transformer Station near Tokyo of the Kinugawa Hydro-Electric Co.



GENERAL FRONT VIEW OF KUROBE MASONRY DAM OF THE KINUGAWA HYDRO-ELECTRIC CO., LTD.



1,800 KV-A. 60,000 V. Water Cooled Transformer; Komazawa Sub-Station of Fuji Gas Spinning Co., made by the Shibaura Engineering Works

The following table gives the working results of the Nagoya Dento K.K., from the second half of 1914, to and including the second half of 1921.

	Average Paid-up Capital	Amount of Profits	Rate of Profit to Paid-up Capital Per cent.	Dividend Rate Per cent.
1914—2nd half	Y.10,637,000	Y.498,000	9.3	8.
1915—1st half	10,637,000	544,000	10.1	8.5
1915—2nd half	10,637,000	547,000	10.3	8.5
1916—1st half	11,050,000	600,000	10.9	9.0
1916—2nd half	11,875,000	754,000	12.7	9.0
1917—1st half	11,875,000	885,000	14.9	10.0
1917—2nd half	12,511,000	985,000	15.7	11.0
1918—1st half	13,112,000	1,150,000	17.5	12.0
1918—2nd half	13,525,000	972,000	14.4	12.0
1919—1st half	13,525,000	1,048,000	15.5	12.0
1919—2nd half	14,762,000	1,405,000	19.0	18.0
1920—1st half	18,875,000	1,470,000	15.7	12.0
1920—2nd half	21,000,000	1,977,000	18.8	14.0
1921—1st half	28,426,000	3,440,000	24.2	20.0
1921—2nd half	44,596,000	3,800,000	17.0	14.0

(The 2nd half, 1921, figures are for the results of business of the Kansai Denki K.K.)

From these figures it can be seen that while before the war, the rate of profit was only slightly above 9 per cent., dividends were 8 per cent. As profit increased, however, its ratio was always greater than the rate of increase in the paid-up capital, consequently it was possible always to increase the dividend. The high dividend of 20 per cent. made in the first half of 1921, was due to the fact that a special dividend of 6 per cent. was distributed to commemorate the thirtieth year of the existence of the Nagoya Dento, and also as a result of the completion of the contracts for the amalgamation with the Kansai Suiryoku Denki K.K.

The continued prosperity of the business of the Nagoya Dento K.K., was due entirely to the increased demand for power which grew out of the industrial expansion of war years. Instead of building expensive power houses for its own use, the company purchased cheap power from others, and distributed it at an enormous profit. This policy was extremely clever at the time, as the company avoided the necessity of tying up a large amount of capital in construction work.

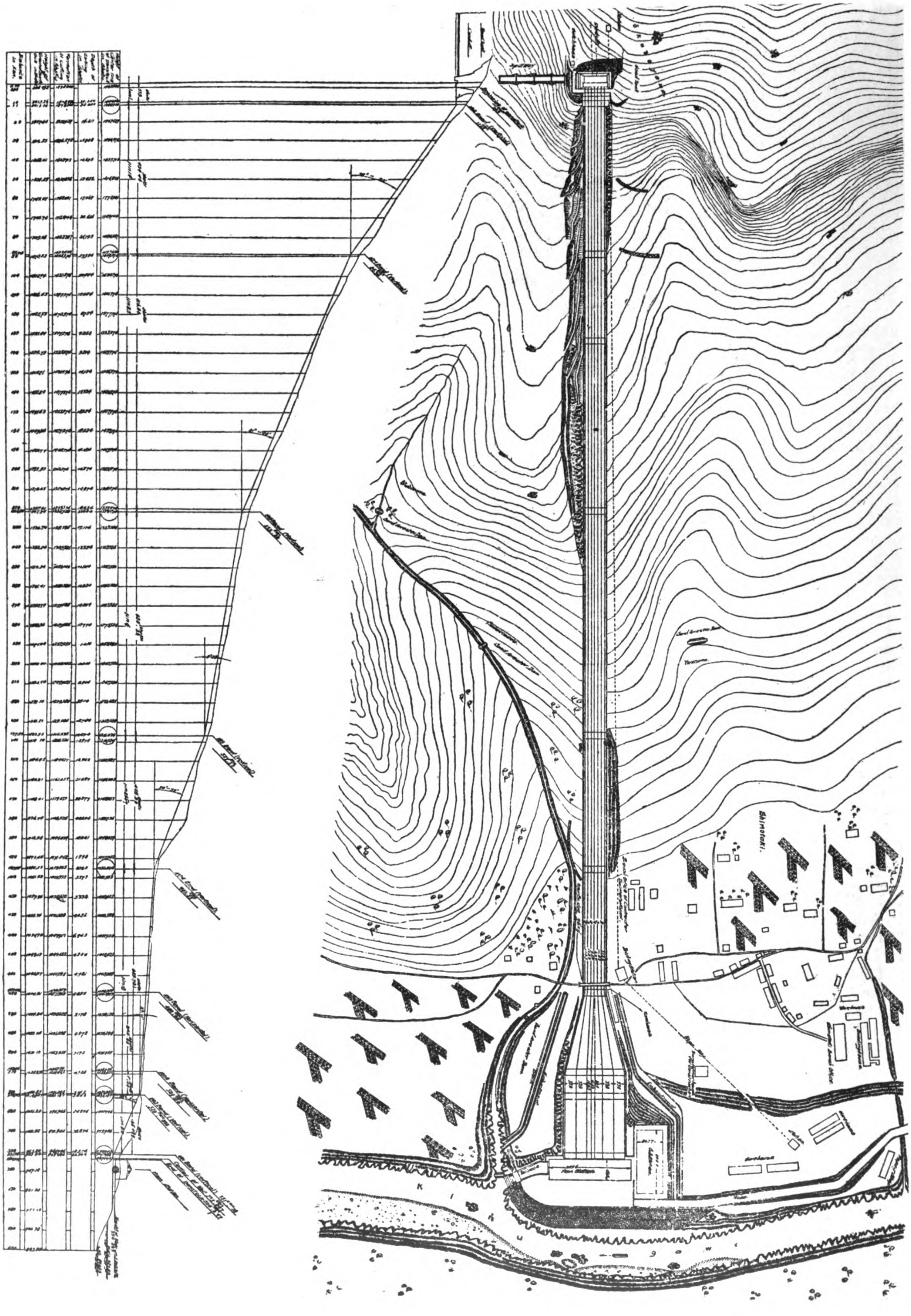
The following tables show the capacity of the power plants owned by the Nagoya Dento at the end of 1914 and at the end of 1920:—

	Dec. 31, 1914.		Dec. 31, 1920
Kisogawa Water Power	7,700 Kw.		—
Magaragawa Water Power	4,000 ,,		4,200 Kw.
Tomoegawa Water Power	750 ,,		750 ,,
Obara Water Power	200 ,,	Yaotsu Water Power	7,500 ,,
		Yaotsu Water Gate, Water Power ..	1,200 ,,
Total	12,650 Kw.	Total	13,650 K.w
Atsuta Coal Power	1,650 Kw.		10,000 Kw.
Lights converted into 10 candle power units	182,024 lights	712,681 lights	
Power sold ..	13,789 H.P.	44,938 H.P.	

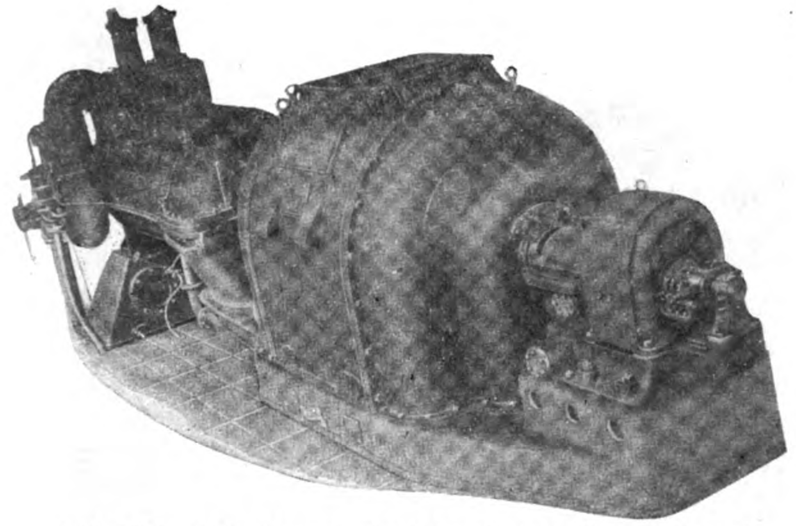
After the various amalgamations were carried out, eventuating in the organization of the Kansai Denki K.K., the power plants owned at the end of 1921 are shown in the following table :—

Yaotsu Water Power	7,500	Kilowatts
Yaotsu Water Gate, Water Power	1,200	,,
Nagaragawa ,, ,, ...	4,200	,,
Tomoegawa ,, ,, ...	750	,,
Kasugawa No. 1 ,, ,, ...	350	,,
,, No. 2 ,, ,, ...	800	,,
,, No. 3 ,, ,, ...	1,800	,,
Nagashino ,, ,, ...	750	,,
Turi ,, ,, ...	500	,,
Shiratani ,, ,, ...	1,500	,,
Yasuge Nos. 1 & 2 ,, ,, ...	413	,,
Kamibuchigawa ,, ,, ...	160	,,
Misano ,, ,, ...	35	,,
Nara No. 1 ,, ,, ...	200	,,
,, No. 2 ,, ,, ...	900	,,
,, No. 3 ,, ,, ...	200	,,
,, No. 6 ,, ,, ...	197	,,
Total	21,458	,,
Atsuta Coal Power	10,000	,,
Nara No. 4 ,, ,, ...	300	,,
Nara No. 5 ,, ,, ...	1,500	,,
Total	11,800	Kilowatts
Lights converted into 10 candle-power units..	1,296,684	
Power Sold	68,159	H.P.

Before the war the Nagoya Dento supplied only 182,000 ten candle power lights, and 13,700 h.p. for motive power, from a production of 12,650 kilowatts from water power, and 1,600 from coal burning plants, a total of 14,250 kilowatts. Six years later, at the end of 1920, the company was supplying 712,000 lights and 44,900 h.p. for motive power, using 13,650 kilowatts from water power and 10,000 kilowatts from the coal burning plants. Compared with pre-war days, the coal burning plant capacity increased 8,400 kilowatts, but water power only increased 1,000 kilowatts. The coal burning plant was only intended as a supplement to its water power operations, hence it was used as little as possible. But without using the capacity of the coal burning plant it was impossible to supply all the light and power wanted, so the Nagoya



A PLAN ANGLE OF SHIMODAKI HYDRAULIC POWER'S PIPE ROAD (KINUGAWA HYDRO-ELECTRIC CO. LTD.)



1,250 KVA. Turbo-Alternator Built for the Takashima Colliery, by the Nagasaki Works of the Mitsubishi Zosen Kaisha, Ltd.
1,250 KVA., 3 Phase, 50 Cycle,
3,300 Volt, 3,000 RPM., 80% PF.
With Direct-Coupled Exciter Compounded with Leakage Path

Dento purchased from the Kiso Denki Kogyo, some 12,600 kilowatts, at very low rates, in order to meet the demands made on it.

Ordinarily, it requires a large amount of capital to built generating stations which is unproductive during the course of construction and for some time after completion or until the entire capacity of the plant can be utilized. The Nagoya Dento by its policy of purchasing power from others avoided this difficulty and thereby enabled to increase its profits every term.

The first business term after the amalgamation closed at the end of 1921. The water power generated had increased to 21,400 kilowatts and the coal burning plants added 11,800 kilowatts. In addition to the total, (33,200 kilowatts) some 27,200 kilowatts were purchased from the Daido Dentyoku K.K., the Ihigawa Denki K.K. and the Yasaku Suiryoku Denki K.K. With this power 1,296,000 lights and 68,000 h.p. for motive power were supplied.

A casual consideration of the figures given is likely to raise some doubt of the purpose behind the successive amalgamations so hurriedly carried out by the Nagoya Dento after 1919. To get a good idea of the reason it is necessary to examine the progress of this company's expenditure on construction, which is given in the next table :

	Dec. 31, 1914.	Dec. 31, 1920.
Cost of Construction ; Water Power Plants	Y.8,007,440	Y.7,888,396
Cost of transmission lines	1,249,234	1,903,012
Total	Y.9,256,674	Y.9,791,408
Electric Light and Power Equipment :		
Transformer station construction expenses	Y.1,115,366	Y.1,588,070
Building distribution lines	1,765,925	4,079,769
Installations	1,564,982	1,564,982
Total	Y.4,446,273	Y.7,232,821
Cost of construction coal burning plant	764,022	1,189,440

At the end of 1921, these expenses itemize as follows :

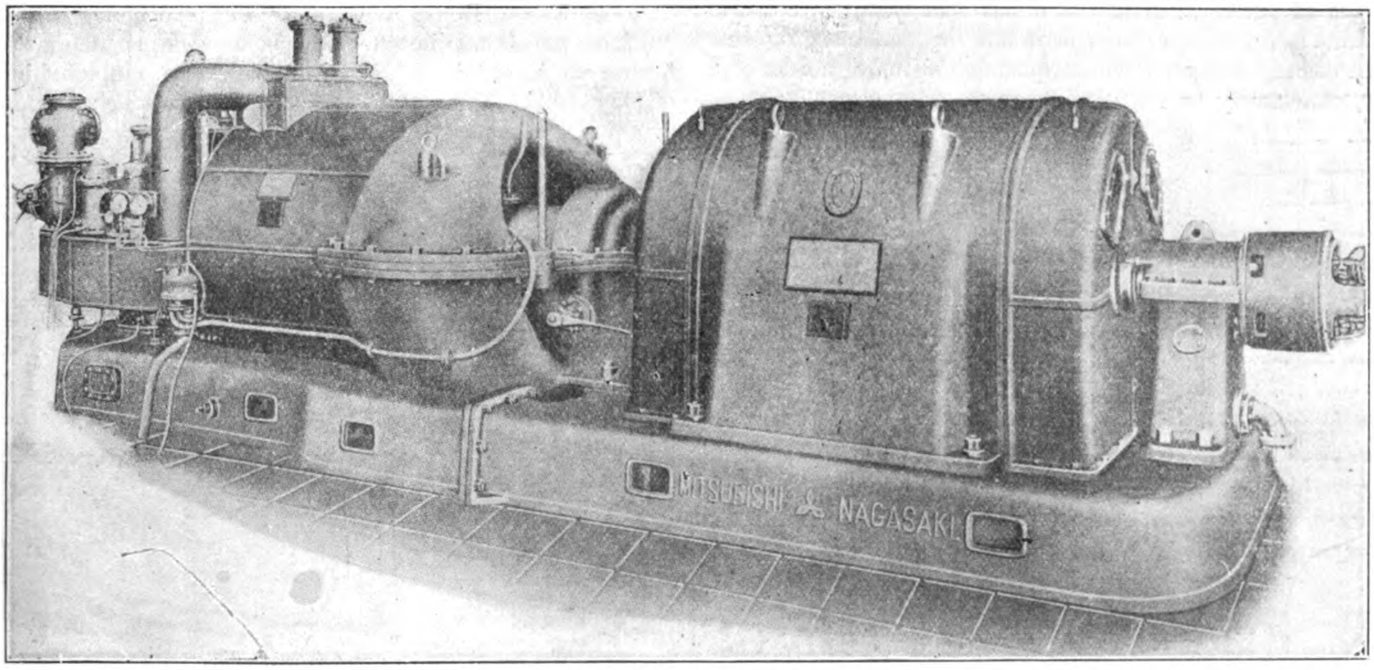
Cost of construction water power plants ..	Y.11,800,658
Cost of transmission lines	2,970,897
Total	Y.14,771,555
Electric light and power equipment:	
Transformer stations construction expenses ..	Y. 3,254,590
Building distribution lines	16,568,539
Installations	3,763,504
Total...	Y.23,586,633
Cost of construction coal Burning plants ..	2,774,494

These figures are compiled by classifying the expenses published in the annual business reports. It is difficult, however, to know whether construction costs be high or low unless they are converted into some formula, such as the cost of construction per light supplied, or per kilowatt.

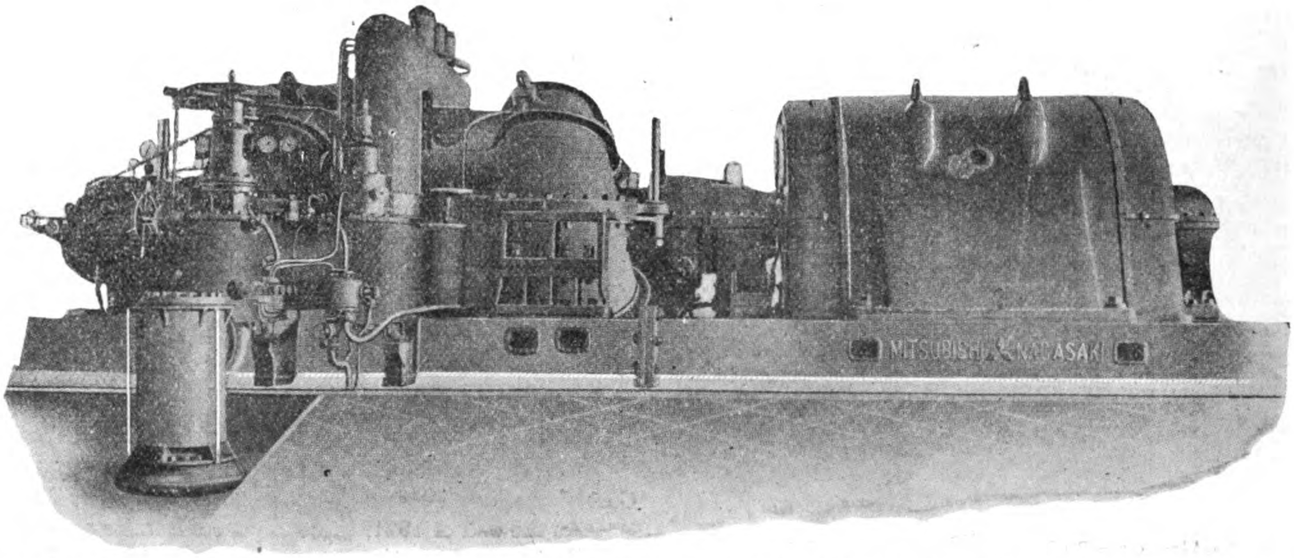
Estimating ten lights as equivalent to one kilowatt, the following table of cost of construction is obtained :—

	1914 Dec. 31	1920 Dec. 31	1921 Dec. 31
Water Power, 1 kilo. ..	Y.731,70	Y.717.30	Y.688.30
Coal Power	477.50	118.90	235.10
Per 10 c.p. light ..	11.80	6.20	11.90

From this table it appears as if there were but little difference in the costs of construction of the water power stations from 1914



3,750 KVA. Turbo-Alternator Built for the Nagoya Dento Kaisha, by the Nagasaki Works of the Mitsubishi Zosen Kaisha, Ltd.
3,750 KVA. 3 Phase, 60 Cycle,
11,000 Volt, 1,800 RPM., 80% PF.
With Direct-Coupled Exciter.



12,500 KVA., Turbo-Alternator Built for the Osaka Dento Kaisha, by the Nagasaki Works of the Mitsubishi Zosen Kaisha, Ltd.
12,500 KVA., 3 Phase, 60 Cycle.
11,000 Volt, 1,800 RPM., 80% PF.
One of 4 Sets

to 1920. In pre-war days, the total capacity of the water power plant. was 12,650 kilowatts. But actually not more than 54 per cent. of this amount was ever used. In 1920, the capacity of these plants had increased to 13,650 kilowatts, but the amount utilized had increased to more than 80 per cent. Although the difference in the cost of construction between 1914 and 1920 was therefore very slight, there was a great increase in the volume of power used.

The increased profits from year to year enabled the company to write off large amounts for replacements. The great decrease in the cost of the coal burning equipment may accordingly be due to the fact that the company wrote off larger amounts for this station than for its water power plants, because it was used only as a reserve supply of power, and consequently its cost of construction was much out of line with its income return.

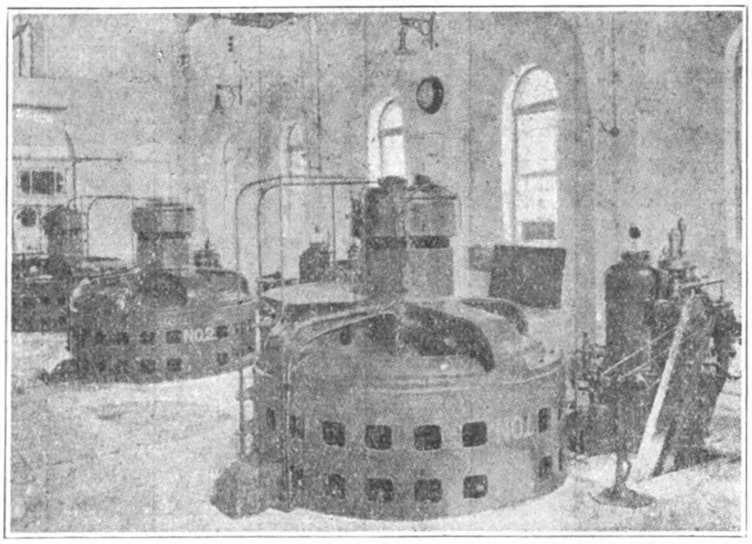
Installations for light and power were increasingly active. Many new customers were obtained who did not need poles erected to ensure their supply. This naturally greatly assisted in bringing down the cost per 10 candle power light supplied.

Examining the company's construction expenses in this manner it becomes apparent that its profits have been enormous. Even paying 14 per cent. dividends it has been possible to retain large amounts as reserves, or to utilize them for machinery replacement. An electric company whose business, is more or less of a monopoly, can hardly be expected to make greater profits or to pay higher dividends than the Nagoya Dento K.K., in the period before its amalgamation with the Kansai Suiryoku Denki K.K.

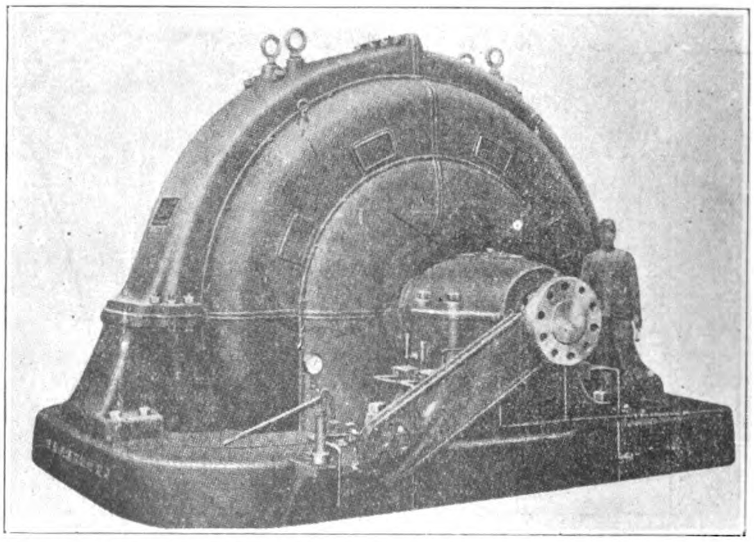
With such extremely high profit rates the company began to be bothered with complaints that its charges were too high and many attempts were made to obtain official action to lower the rates for light and power supply. In this condition of affairs, the Nagoya Dento began to look around for possible amalgamations which would cut down the percentage of its fixed capital compared to its paid up capital, to some such low point as in pre-war days. The amalgamation with the Kansai Denryoku K.K., was the result.

As a result of this amalgamation at the end of 1921, the fixed capital, or cost of construction, was cut to Y.688.00 per kilowatt, of water power, to Y.235.00 per kilowatt of coal power and the cost of one light was increased to Y.11.90. The purpose of the amalgamation, it can hardly be doubted, was to decrease the income-earning value of the Nagoya Dento. The pre-war figures of cost have evidently been taken as the standard, so the result of the depreciation can not be considered in too unfavorable a light.

The Kansai Denki K.K., plans to make many other amalgamations, which will be effected just as soon as the government's license can be obtained. Many of them were completed by the end of May, 1922. Some of the companies with which amalgamations



Three 1,875 K.V.A. 11,500 Volt 500 R.P.M. 50 Cycle Vertical Shaft Generators built by the Shibaura Engineering Works for the Wakayama Hydro-Electric Co.



6,666 K.V.A. 6,600 Volt 375 R.P.M. 50 Cycle Generator, Enclosed-Ventilated for the Inawasiro Suiryoku Denki Kaisha built by the Shibaura Engineering Works

are to be effected are almost as important financially as the former Nagoya Dento K.K., the Kyushu Dento Tetsudo K.K., in especial, being one of these. It is natural then that the capital of the Kansai Denki will be increased.

It is reported that on amalgamation the Hokusei Denki K.K. will receive 13/3/10 shares of the Kansai Denki K.K., for each ten shares of its old issues. While the Yawata Suiryoku will receive two for one and the Bishu Denki 13 for 10.

On the basis of these amalgamations the fixed capital of the Kansai Denki at the end of May, 1922 ought to be :

Cost of construction, water power plants ..	Y.18,410,767
Cost of transmission lines	5,621,141
Total	Y24,031,908
Electric Light and Power Equipment :	
Transformer stations, construction expenses	4,567,068
Transmission lines and installations.. ..	32,983,640
Total	Y.37,950,708
Cost of construction, coal-burning plants ..	Y.12,412,194

Compared with the end of 1921, this is an increase of Y.33,-260,000.

When the amalgamations are completed, the company's power plants will be :

Water power plants	37,678 kilowatts
Coal burning plants	46,850 ,,
Lights, converted into 10 candle power units	2,500,617 lights
Power sold	107,991 H.P.

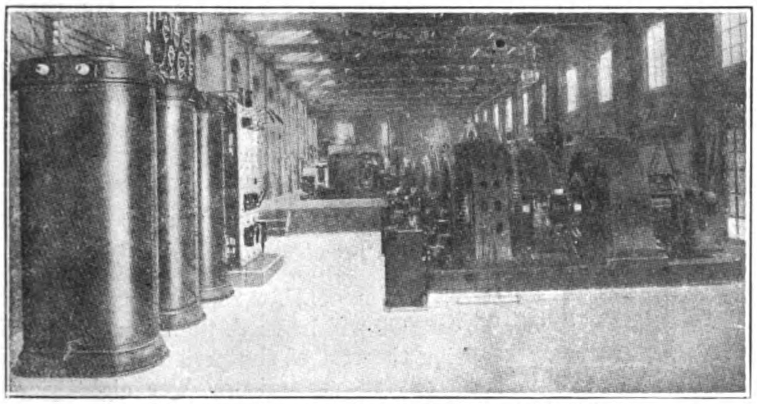
An increase in water power capacity of 16,200 kilowatts will be one of the results of the amalgamation, as the Kawakami River, Kyushu and several other large power plants will be added to its equipment. The capacity of the coal burning plants will be increased by the addition of plants at Maeda, Najima and Nagasaki.

The number of lights will be increased by about 50 per cent., reaching 2,500,000 in all; while the power sold will increase 60 per cent. to 107,000 h.p.

Compared to the end of 1921, the cost per unit of power will be as follows :

	Dec. 31, 1921.	Dec. 31, 1922.	Increase or decrease
Water power, 1 kilo.	Y.688.30	Y.637.80	Dec. Y.50.50
Coal power, 1 kilo.	235.10	264.90	Inc. 29.80
Per 10 c.p. light ..	11.90	10.60	Dec. 1.30

The increased cost of the coal power units is due to the amalgamation with the Kyushu Dento Tetsudo K.K., with its coal burning plants at Najima and Nagasaki.



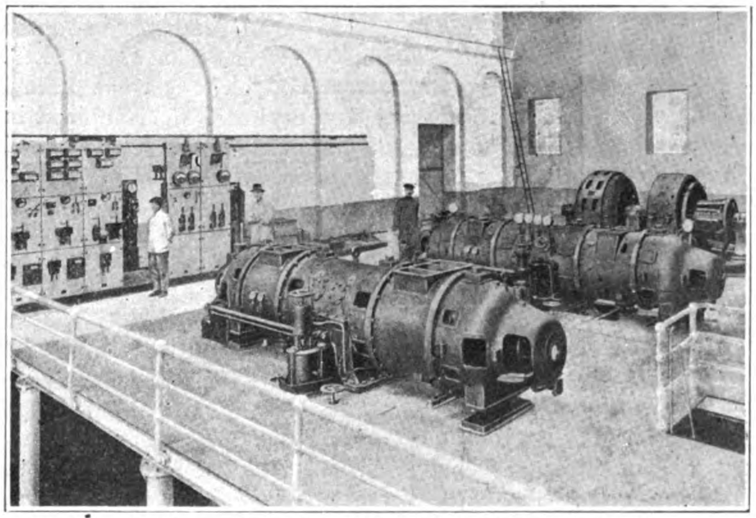
No. 1 Power House of the Kobe Mitsubishi Works

The Najima power plant is built in the outskirts of the city of Fukuoka. The site is larger than is at present necessary, but it is capable of expansion without great expense.

The installations of these newly amalgamated concerns were all war purchases, so they are relatively expensive. Consequently the cost per kilowatt for coal power plants has increased Y.30.00 by these recent amalgamations.

But the cost of light and water power units has been materially lowered, which proves that the Kansai is bettered by making these amalgamations.

After making the amalgamations with the Kyushu Dento Tetsudo, the Bishu Denki, the Yawata Suiryoku and the Hokusei



No. 2 Power House of the Kobe Mitsubishi Works: Turbo-Generating Sets made by the Mitsubishi Works

Denki, the Nagoya Gas Co., will be absorbed. This will complete the planned amalgamations for the present.

At present the Kansai Denki K.K., holds some 524,000 shares of the Daido Denryoku K.K., amounting to Y.26,000,000 on which Y.12,000,000 has been paid up. It still is liable for Y.14,000,-000 to be paid the Daido Debryoku. It is also liable for some Y.3,000,000 to be paid the Nohi Denki K.K. and the Gifu Kogyo K.K., in which it holds investments also. On its investments it receives about 8 per cent. a year.

Should the Kansai Denki resort to making calls on its unpaid capital in order to meet its obligations to others when they become due, it may be difficult to continue paying 13 per cent. dividends. It is, accordingly, said that company plans to issue debentures for the amount of its obligations to others, because debentures can easily be floated at 9 per cent., thus effecting a saving on earnings.

It may therefore be taken for granted that the Kansai Denki K.K., will continue its career of expansion without detriment to the profits it has been paying its shareholders.

Japan's Iron and Steel Production in 1921

According to a report of the imperial department of agriculture and commerce, the production of iron and steel in Japan during 1921 was considerably decreased, although on the whole the results of production were good. There are now signs of recovery in Manchuria and Chosen.

Production 1921.	Japan Proper	Chosen	Manchuria	Total
Pig iron	476,127 tons	83,010	93,951	653,088
Iron and steel alloys ..	7,574	—	—	7,574
Charcoal steel ..	764,551	51,016		816,167
High speed steels ..	20,444	—	—	20,444
Raw material for making charcoal steel ..	479,783	30,026	—	509,809
Forged steel	101,724	—	—	101,724
Others	68	—	—	68

Japanese Engineering Notes

Rail and Tramway Combines

THE Morioka Electric Industrial Co. and the Onsen Tramway Co. were amalgamated on May 1. The Ise Electric Railway Co., Tsu Electric Light Co. and the Matsuzaka Electric Co. were voluntarily dissolved on April 30, and on May 1 combined under the name of the Mie Amalgamated Electric Companies Ltd. On May 8, 1922, the Iyo Railway and Electric Co., the Ehime Hydro-Electric Co., the Kawakami Hydro-Electric Co. combined in order to finance the increased business of the Iyo Tetsudo Denki K.K. The capital of the new organization will be increased to Y. 16,500,000.

Official approval has been obtained for the amalgamation of the Yoro Tetsudo K.K. (Yoro Railway Co., Ltd.) with the Ihigawa Denki K.K. (Ihigawa Electric Co., Ltd.) and for an increase of capital to Y. 10,000,000. On May 15, 1922, the amalgamation of the Kyushu Dento Tetsudo K.K. (Kyushu Electric Light and Railway Co., Ltd.) with the Kansai Denki K.K. (Kansai Electric Co., Ltd.) was announced. The Kansai Denki will increase its capital to Y. 133,041,200 as a result of this and previous amalgamations with the Hokusei Denki K.K., the Aiki Denki Kogyo K.K. (Aiki Electric Industry Co., Ltd.), the Tokyo Suiryoku Denki K.K. the Yahata Suiryoku Denki K.K. and the Bishu Denki K.K. The Sunen Denki K.K. absorbed the Hagoromo Seihyo K.K. (Haoromo Ice Manufacturing Co., Ltd.) and the Abe Denki K.K. on May 26, 1922 and its capital increased to Y. 3,550,000.

The Hokkaido Seito K.K. (Hokkaido Beet Sugar Co., Ltd.) operates for its own use 2 miles and 22 chains of light railway between Obihiro Machi, Kawanishi Bu, Tokachi Hokkaido and Taisho Mura. The line is standard Japanese gauge 3 feet 6 inches. These lines were recently licensed to carry freight and passengers for the general public and are now under the operation of the local railways law. The cost of construction of this short line was Y. 149,702. The capital of the company is Y. 10,000,000.

The Keihan Denki Tetsudo K.K. (Kyoto-Osaka Electric Railway Co.) was originally licensed under the provisions of the tramway construction law. The line is electrically operated between Hamura, Honjo, Kita Ku, Osaka city and Omiya-machi, Shijo, Nishi Ku and Kyoto city, a distance of 27 miles and 20 chains. The gauge is 4 feet 8½ inches. The capital of the company is Y. 36,000,000 and the cost of construction is Y. 25,000,000. The company was recently obliged to change its license and become a local railway.

CAPITAL INCREASES.—The Shiratana Tetsudo K.K., operating between Shirakawa-machi and Tanakura-machi, 14 miles, 51 chains, on November 30, 1921, applied for official sanction to increase its cost of construction to Y. 700,000. The approval was obtained in May.

The Akao Tetsudo K.K., operating between Shiohama and Aritoshi on April 30, 1922, has increased its cost of construction to Y. 750,000. The following companies have increased their capital; the Hokuso Tetsudo K.K., to Y. 1,500,000, the Hase Tetsudo K.K., to Y. 150,000, the Jinchu Tetsudo K.K., to Y. 700,000, the Chichibo Tetsudo K.K., to Y. 1,000,000 and the Osaka Tetsudo K.K., to Y. 3,000,000.

New Railway Lines

The following new railway lines were opened to business between April 1 and May 31, 1922 :—

Gojome Tetsudo K.K., from Gojome to Goji, 2 miles, 31 chains ; Chikuma Tetsudo K.K., from Hata to Shinmura, 3 miles ; Sagami Tetsudo K.K., from Samukawa to Higashi Shinomiya, 1.2 miles ; Osaka City Electric Railway Department, from Kobayashi-machi to Tsurumachi 4 chome, 1 mile, 6 chains ; Ikoma City Electric Railway Co., Ltd., from Oji to Yamashita, ½ mile, from Yamashita to Shigiyama, 1.1 mile ; Osaka City Electric Railway Department, from Shikajima-machi to Shimaya-machi, 1 mile, 53 chains ; Tokyo City Electric Bureau, from Shibuya-machi to Nakashibuya, 6 chains ; Chichibu Tetsudo K.K., Kagemori to Buko, ¼ mile, Kunigami to Arakawa 3/5 miles.

WATER POWER SITES.—According to a report of the department of communications there are 1,126 sites available for development of hydro-electric power in Japan. There are eight rivers yielding more than 100,000 h.p. each, with 68 sites with a potential power of more than 10,000 kilowatts. It was expected to complete details of the investigation before the end of March, 1923, but owing to lack of funds the survey has been suspended this year.

TRAMWAY FOR SENDAI AND TOYOHASHI.—A survey for tramways is Sendai has been finished, and a company will soon be licensed to undertake construction. The city of Toyohashi, in Aichi prefecture, is also considering a street railway system to be operated by the municipality.

ELECTRIC RAILWAY MERGER.—The Nankai Tetsudo K.K. (Nankai Railway Co., Ltd.), the Osaka Koya Tetsudo K.K. (Osaka Koya Railway Co., Ltd.) and the Koya Daishi Tetsudo K.K. (Koya Daishi Railway Co., Ltd.), effected a merger with a capital investment of Y. 50,000,000. It now practically controls private railway transportation in the district south of Osaka and around Wakayama.

KUHARA SEEKS POWER SITES.—The Kuhara Kogyo K.K. (Kuhara Mining Co., Ltd.), a pioneer in the use of electric power for mining operations in Japan, has turned its attention to developing water power along with its mining projects and has recently secured power rights to more than 70,000 kilowatts. As soon as official licenses are obtained, these will be developed, and power houses erected. Two more sites, one to develope 20,000 kilowatts and the other 50,000 kilowatts, have been applied for.

JAPANESE ELECTRIC LAMPS FOR SIBERIA.—The demand for electric bulbs is gradually increasing in Manchuria and Siberia. The Japanese bulbs are in demand in those territories where cheapness of price is more desired than quality. Japanese merchants are looking forward to increased sales in these territories and are taking steps to improve the quality of their products. About 1,000,000 bulbs a month are now shipped from Japan to these districts.

OSAKA MUNICIPALITY TO PURCHASE OSAKA DENTO.—It is reported that the Osaka municipality is making preparations to purchase the business and equipment of the Osaka Electric Light Co., Ltd. The basis of the purchase price will be the company's cost of construction, plus a compensation to be determined. Since the plan to purchase was decided upon, the light company has greatly expanded its business, but the municipality is determined to make the purchase at any cost.

HARBOR CONSTRUCTION IN JAPAN.—The engineering bureau of the home department has allocated the funds voted at the last session of the diet for the improvement of the harbors at Takamatsu, Tsuruga and Sakai.

For the improvements at Takamatsu covering a period of five years beginning 1922, a sum of Y. 2,200,000 was granted. During this fiscal year Y. 415,000 will be used, the balance in more or less equal amounts during the rest of the period. At Tsuruga Y. 3,400,000 will be allotted for expenditure over eight years. During the present year Y. 110,000 will be used. From 1922 to 1927 a sum of Y. 1,800,000 will be spent at Sakai.

CEMENT MERGER.—The Toyokuni Cement Co., Ltd., of Fukuoka city, with a capital of Y. 5,000,000 ; Y. 1,750,000 paid up, has been merged with the Nagoya Cement Co., Ltd., of Nagoya city, capital,

Y. 2,000,000; paid up, Y. 500,000 and the Saga Cement Co., Ltd., of Saga prefecture, capital, Y. 800,000, all paid up, the Nagoya Cement Co., called up a payment of Y. 10.00 per share on its outstanding unpaid capital and the Toyokuni took over both the other companies with all their debts and property as they stood on June 1, 1922. The capital of the Toyokuni Cement Co., Ltd., has accordingly been increased to Y. 7,500,000 and for the increase of Y. 2,500,000, fifty thousand shares of new stock have been issued. A bonus was paid to the employees and directors of the two merged companies.

Japan Electric Power Co.

The new 24,000 kw. Seto power plant of this company will be completed this year. This company now purchases 26,000 kilowatts from others. When the new plant is completed it will have 50,000 kilowatts of power to distribute in the Osaka district.

Ujigawa Electric Co.

On reclaimed harbor land owned by the municipality of Osaka, the Ujigawa Denki K.K., plans to erect a new coal-burning power plant, at the juncture of the Kitsugawa and the Kitsu river canal. The site, 16,000 *tsubo* (576,000 sq. ft.) is leased for thirty years at 12 sen per *tsubo* per year, with a slight rise in rental each five years.

Fuji Hydro-Electric Co.

The Fuji Hydro-Electric Co., Ltd. has issued Y. 3,000,000 of debentures through the Yasuda Ginko of which Y. 2,000,000 is to redeem outstanding indebtedness, and Y. 1,000,000 for installing 16 miles of transmission wires between Numadzu and Kozu and a new transformer station at Atsugi-machi, to supply light and power in that part of Kanagawa prefecture.

Kyushu Hydro-Electric Co.

On June 1, 1922, the last payment of capital amounting to Y. 12.50 a share, a total of Y. 4,900,000 was called up by the Kyushu Suiryoku Denki K.K., to redeem outstanding debts and debentures. The Mitsui interests will receive Y. 3,000,000 and debentures amounting to Y. 1,200,000 redeemed. This company now has under construction hydro-electric power plants at Oyama, Imahata and Chinda and a coal-burning plant at Fukuoka city. For these four plants Y. 4,500,000 to Y. 5,000,000 is needed. Another power plant not yet commenced requires another large sum. Before these plants can be completed, it will be necessary to double the existing capital at a proper opportunity. Present capital is Y. 37,400,000, all paid up.

Nankai Hydro-Electric Co.

The Nankai Hydro-Electric Power Co., Ltd. (address 1030 Hikata-machi, Kaiso-gun, Wakayama prefecture) has decided to increase its capital of Y. 1,000,000 to Y. 2,500,000 and to call up the first payment on August 1, 1922. This company owns the following power plants :

1. Kamimatsubara, Ishigaki Mura, Arita Gun, Wakayama Prefecture, on the Arita River. This plant is now under construction to generate 350 kilowatts, with a high-tension voltage of 11,500.
2. Surigawa, Ishigaki-mura, Arita-gun, Wakayama prefecture, on the Arita River. The 200 kilowatt power generated by this plant is used for a reserve supply. High-tension voltage of 3,450.
3. Coal-burning plant. Nadaka, Uchimi-mura, Kaiso-gun, Wakayama prefecture. This 300 kilowatt plant is now under construction and its power will be used for reserve. High-tension voltage of 3,450.
4. Kawaguchi, Iwakura-mura, Arita-gun, Wakayama prefecture, on the Arita River. This 500 kilowatt plant is now under construction, 3,450 volt.
5. Numa, Yahata-mura, Arita-gun, Wakayama prefecture, on the Arita River, also under construction to produce 1,450 kilowatts.
6. Uses power purchased from the Wakayama Suiryoku Denki K.K., 575 kilowatts.
7. Uses power purchased from the Hitakagawa Suiryoku Denki K.K., 250 kilowatts.

The total power generated and purchased is 825 kilowatts; under construction, 2,300 kilowatts ; reserve, 200 kilowatts and under construction, 300 kilowatts. Besides these power plants operating and under construction this company owns four transformer stations. The Nankai Suiryoku Denki K.K. was established in June, 1904 and began business in 1910. It supplies light and power in Kaiso-gun, Naka-gun, Arita-gun and Kaiso-gun in Wakayama prefecture, to four towns and 27 villages and the power for the Nogami light railway company.

The officers are : President : Ichirobei Kamiyama ; Managing Director : Shichiroeimon Gozen ; Directors : K. Gozen and Z. Morita ; Chief Engineer : N. Fujii.

Electrical Companies Combine

The Tsu Dento K.K. (Tsu Electric Light Co., Ltd.), capital, Y. 2,000,000; paid up, Y. 1,500,000 ; the Matsuzaka Suiryoku Denki K.K. (Matsuzaka Hydro-Electric Power Co., Ltd.), capital, Y. 2,000,000 ; paid up, Y. 1,025,000 and the Ise Denki Tetsudo K.K. (Ise Electric Railway Co., Ltd.), capital, Y. 4,000,000; paid up, Y. 2,050,000, have received permission to amalgamate.

The capital of the new company will be Y. 12,500,000. The Tsu Dento K.K. owns one hydro-electric power plant and three coal-burning plants, producing a total of 940 kilowatts. It has under construction, one hydro-electric and one gas-burning power plant to generate 448 kilowatts.

The Matsuzaka Suiryoku Denki K.K. owns and operates one hydro-electric, one coal burning and two gas-power plants, generating 875 kilowatts. It also has under construction one hydro-electric power plant to generate 700 kilowatts.

The Ise Denki Tetsudo K.K. owns one coal-burning and one gas-power plant, generating 485 kilowatts. It also has under construction one hydro-electric plant to generate 832 kilowatts and another projected plant to utilize 1,000 kilowatts, which it planned to purchase from the Mie Kyodo Denryoku. The power for this plant will, however, now be supplied by other members of the new amalgamation.

Tokushima Hydro-Electric Co.

At the end of 1921 the Tokushima Suiryoku Denki K.K. (Tokushima Hydro-Electric Electric Power Co., Ltd.) has annexed three small companies, the Fukura Dento K.K. (Fukura Electric Light Co., Ltd.), the Yura Dento K.K., (Yura Electric Light Co., Ltd.) and the Awaji Denki K.K. (Awaji Electric Co., Ltd.)

It recently absorbed the Sotanigawa Suiryoku K.K., capitalized at Y. 4,000,000. The capital of the Tokushima Suiden Y. 7,250,000, will be increased to Y. 12,000,000. The Tokushima Suiden owns two hydro-electric power plants generating 1,800 kilowatts and one under construction to generate 730 kilowatts ; two coal-burning plants, for reserve power, now generating 950 kilowatts. It also purchases from the Fukushima Boseki K.K., 500 kilowatts ; a total actual generating output of 2,300 kilowatts, with 730 under construction. The Sotanigawa Suiryoku Denki K.K. owns four hydro-electric power plants in operation, generating 2,766 kilowatts.

Sakusawa Electric Railway.—A new electric railway between Tanaka station on the Shinyetsu line of the Imperial Government Railways, and Kayano station of the Chuo line of the Imperial Government Railways, a distance of 35 miles, will be built by a new company, called Sakusuwa Denki Tetsudo K.K. (Sakusuwa Electric Railway Co., Ltd.), capitalized at Y. 500,000. The first call of Y.50,000, one-tenth of the total, has already been paid in.

This line passes through a district of summer resorts and hot springs rich in natural products. The Imperial Government Railways will bring large numbers of passengers to its terminals, ensuring the prosperity of the line.

South Osaka Electric Railway

The imperial government department of railways has granted permission to the South Osaka Electric Railway Co., Ltd. to begin construction of the first part of its line between Sakai city and Takada in Yamato province, nineteen miles and some chains. Work will be begun in the very near future.

Tsukushi Electric Railway

The Tsukushi Electric Railway Co., Ltd., operating between Kurume and Fukuoka, in Fukuoka prefecture, Kyushu, a distance of 24 miles, double track, gauge 4 feet 8½ inches, has decided to use the latest type of high-speed tram car. These cars will carry 80 passengers and travel at a speed of 50 miles and hour, which is faster than any steam line in this country. The distance between Kurume and Fukuoka, with stops, will be covered in 50 minutes.

Electrification of Yoro Railway

The Yoro Tetsudo K.K., which operated 35.8 miles of steam railway (gauge 3 feet 6 inches, weight of rails 45-lbs.), between Ihi and Kuwana in Gifu prefecture, amalgamated with the Ihi River Electric Co., Ltd. on June 1, 1922. The Yoro Tetsudo K.K. was capitalized at Y. 5,000,000 and the cost of its lines to March 31, 1922, was Y. 3,200,000. The Ihigawa Denki K.K. owns two hydro-electric power plants in operation, generating 11,900 kilowatts and has under construction another hydro-electric plant to generate 3,000 kilowatts. It also has a coal-burning plant held in reserve with 1,250 kilowatts. It was capitalized at Y. 10,000,000; paid up, Y. 6,250,000, and loans outstanding, June 30, 1921, of Y.6,893,381. Its address is Shintomi Cho, Kyobashi Ku, Tokyo.

In effecting the amalgamation, the capital of the Ihigawa was paid up to the amount of Y. 8,000,000 and the Y. 4,000,000, of the Yoro Tetsudo added to it to make the capitalization of Y. 12,000,000. The total capital, now paid up, is Y.10,000,000. The new company will complete the construction of the Hirosegawa power plant of the Ihigawa Co., and the steam line of the Yoro Tetsudo will be electrified. In addition, the projected railway line between Kuwana and Yokkaichi will be completed and electrified. To carry out these plans the capital of the amalgamation will be increased to Y. 20,000,000 during this year.

Ikoma Electric Railway

The Ikoma Electric Railway Co., Ltd., has completed the first section of its line between Oji and Shinkizan, 1 mile, 5 chains. The second section between Shinkizan and Ikoma will be completed in 1924. The first section is a mountain line, operated by cable. The section still unbuilt is on a level bed and will be operated by electricity.

Nankai Railway

The Nankai Tetsudo K.K. (Nankai Railway Co., Ltd.) will construct a double track along a large part of its line south of Koshizan, between Osaka and Wakayama. In order to obtain funds for this construction, the present capitalization will be increased to Y. 44,000,000.

Mitsui Electric Railway

The Mitsui Denki Tetsudo K.K. (Mitsui Electric Railway Co., Ltd.) operates 20 miles of electric railway between Amaki-machi, Asakura-gun, and Fukushima-machi, Yame-gun, in Fukuoka prefecture, passing through Kurume city. It also supplies light and power in the zone of the railway. Its capital is Y. 2,000,000; paid up, Y. 1,250,000. The line will shortly be extended from Amaki to Iidamachi, Tagawa-gun, Fukuoka prefecture, 3 miles, and a branch line constructed from Okuma-machi to Iizuka-machi, Kaho-gun, 7 miles. The line is 4 feet 8½ inch gauge. The company owns 16 cars. It obtains its power from the Kyushu Dento Tetsudo K.K. and the Kyushu Suiryoku Denki K.K., 350 kilowatts in all.

New Electric Companies

1. Yamatake Dento K.K. (Yamatake Electric Light Co., Ltd.), Main Office, Minami Kinroku Cho, 4, Kyobashi Ku, Tokyo.

Object: (1) To supply light and power. Buy and sell electric machinery, etc.; (2) to invest in other companies of like business.

Established: April 26, 1922. Capital. Y. 500,000, one-fourth paid up.

Officers: Representative Director: Yasukata Sonoda; Directors: M. Nakamura and T. Kase; Auditor: N. Akiba.

2. Kimoe Denryoku K.K. (Kimoe Electric Power Co., Ltd.)

Main Office: 620, Shiogama, Mizukawa-machi, Izawa-gun, Iwate prefecture.

Objects of Business: To supply light and power and to invest in companies of similar business. Manufacturing graphite.

Established: November 8, 1921. Capital: Y. 750,000, all paid up.

Officers: Directors: K. Ono, A. Oyobigawa, H. Yuzugi, Y. Eda, Y. Tsujiyama, S. Kobayashi, J. Goto, Y. Aoki and C. Sasaki. Auditors: K. Hanayama, J. Ogita, F. Yoshida and J. Soyeda. (All Iwate prefecture capitalists)

Change of Name: The Aikawa Denki K.K. (Aikawa Electric Co., Ltd.) of Kanagawa prefecture, changed its name to Sobu Denryoku K.K. (Sobu Electric Power Co., Ltd.), on March 16, 1922.

Furukawa Opens New Cable Factory

The Furukawa Denki Kogyo K.K. of Tokyo has recently erected a factory in Yokohama for the manufacture of marine cable. The factory consists of three mills, of which, the first is devoted to the manufacture of insulated and non-insulated electric wire and lead tubes. The second mill will produce enameled cable and wire for high-tension lines and also telephone cord. The third mill will produce paper insulated telephone and telegraph cord and paper insulated motor wire. The annual production of all three mills is estimated at a value of Y. 17,000,000. Annual capacity is Y. 30,000,000 worth of cable, cord and tube. An order has already been received from the Chinese government for 535 nautical knots of marine cable, to be used in the Chefoo-Shanghai cable. With the opening of this factory, it is believed, that an end will soon be put to Japan's imports of marine cable and high-tension wires and a balance of exports be shown within a few years.

Electric Heater Factory Planned

A new company to manufacture electric heaters, named the Nihon Dennetsu Kogyo K.K. (The Japan Electric Heat Industrial Co.), is planned by the Osaka Dento K.K., which will hold 10,000 shares, the Daido Denryoku K.K., with 5,000 shares, the Kansai Denki K.K., with 5,000 shares, the Kyoto Dento K.K., with 3,000 shares and the officers of the Osaka Dento K.K., with 5,000 shares. The total capital will be Y. 2,000,000; paid up, Y. 500,000. Twelve thousand of the forty thousand shares will be offered to the public. Many of the directors and shareholders of the Hanshin Dentetsu K.K. have expressed their desire to subscribe for these shares. This company will purchase the Ukita Dennetsu K.K., for Y. 125,000 and the ground used for exhibition of its electric machinery by the Osaka Dento K.K. By agreement with the Ujigawa Denki K.K., this company is also now planning to establish the Kawakita Denki K.K. (Kawakita Electric Machinery Co., Ltd.), with a capital of Y. 200,000.

HYDRO-ELECTRIC POWER SURVEY ABANDONED.—The hydro-electric power survey which has been carried on by the department of communications since 1918, will have to be abandoned during the fiscal year 1922-1923, because of lack of funds. Surveyors in the field are all recalled from the end of June, 1922.

It is hoped that the work may be continued after this year, until completed. The completion will take three or four years, at an expense of Y. 300,000 a year.

Osaka Arsenal to be Electrified

The government arsenal at Osaka is using a few electric motors, but it still possesses three dozen chimneys which belch forth smoke in the east of the city much to the distress of the people living near it. The electric motors in use have been so satisfactory

that the chief of the arsenal staff, Colonel Kurosaki, is desirous of replacing all the coal-burning furnaces with electric machinery. Power is now purchased from the Ujigawa Denki K.K. and this company would be drawn on for the increase of power required by a complete electrification. No funds are now available for the change, but it is believed that this improvement can be managed from the working funds of the institution. At least the workshop can be completely equipped with electric power, in response to a demand on the part of the workmen for more modern working conditions.

Giant Radio Company for Japan

A wireless company capitalized at Y. 200,000,000 which will greatly facilitate communications between Japan and America, will soon be established in Japan, if the plans as formulated by the Nippon Yusen Kaisha, the Osaka Shosen Kaisha, the Industrial Bank, Suzuki & Co., Takata & Co., Mitsui & Co., Okura & Co., Fujita & Co., Viscount Shibusawa and other leading financiers of Japan receive the support of the government and are brought to a completion.

The plans have been laid before Premier Kato and received his private sanction. They will later be taken up formally and from present indications will be approved.

The proposed company desires to form a company which will favorably compare with the Marconi Company of Great Britain, the Radio Corporation of America and the Telegraph Company of France. It will concern itself primarily with improving communications across the Pacific. The promoters state that as soon as the government has approved their plans, they will make a formal statement regarding the proposed action. Several expert engineers of Japan have signified their willingness to aid in establishing the company, according to recent reports.

Electric Tube for Kobe

Kobe plans to build an underground electric railway, which will traverse the city lengthwise. Tentative consent to the plans has been obtained from the city's council and an appropriation of Y. 260,000 as expenses of investigation is shortly to be asked for.

The plan informally presented at a meeting of the council on July 20 and tentatively agreed, provides that an underground electric railway be built, starting from the city's eastern boundary, paralled with the present surface steam railway, turning at the Aioi bridge to Naka-machi, through the Hyogo railway station, and under the 8 *ken* road of Nishi Shinkaichi reaching to the Sakai river on the city's boundary on the west. The entire length is to be about 4.88 miles. The proposed underground railway is to run under the future national road. The trains are to be high-speed ones.

In future, the line is to be extended to Osaka in the east and Akashi in the west.

An amount of Y. 260,000 shortly to be asked for is to be used in three years of investigation, from 1922-3 to 1924-5, so that the work of investigation may be commenced at once.

English Electric Locomotives for Japan

THE Imperial Government Railways of Japan have just placed with the English Electric Company for their Dick Keer Works at Preston an order for 34 complete electric locomotives of the total value of upwards of £500,000. This represents the whole requirement of locomotives up to the end of 1923 for those sections of their main line railways which the Japanese government have decided to electrify at once. The order was obtained in the face of keen foreign competition, particularly from America, and was placed with the English Electric Company, after the fullest investigation by Japanese engineers into the systems in operation in different parts of the world owing to their confidence in the excellence of British design and workmanship.

Eight of the locomotives now ordered are for heavy express passenger service. They are of the 2-C-C-2 type. Their weight is approximately 96 tons and they are designed to haul a 415-ton train at a balancing speed of about 60 miles per hour. Each locomotive is equipped with 6 D.K. 86A. Motors rated at 306 h.p. at 500 volts, the motors being connected in two groups of three in permanent series on a trolley voltage of 1,500 volts. The control equipment is the standard " English Electric " cam-shaft multiple unit type.

Of the remaining locomotives, nine are for local passenger service and 17 are for heavy freight service. These 26 are all of the B-B. type and will weigh approximately 56 tons each. They are equipped with 4 D.K. 86A. Motors similar to those on the express passenger locomotives, but in this case the motors will be connected in two pairs in permanent series. Here too the control is the standard " English Electric " multiple unit type. The locomotives for local passenger service are designed to haul a 315-ton train and the freight locomotive a 600-ton train, the balancing speeds being about 55 and 40 miles per hour respectively.

Japanese Dockyard to Build Electric Locos

The plan of electrifying the Tokaido railway line recently made public by the government seems to have given a sensation to all Japanese dockyard companies. Since the fatal blow was dealt on the dockyard business which was in utmost distress, by the naval limitation, they have been doing anything such as repairing and casting, manufacturing the bridges, locomotives, oil tanks, or electric cars. All of them are now reported to be pinning their hope in the materializing of the plan, in order to get the order for electric locomotives and cars. Above all, the Kawasaki Dockyard Company has already dispatched an engineer to the United States to study construction, and a part of the works is in course of reconstruction for the purpose. The estimated expenditures on the electric locomotives being only Yen 35,000,000 their obtaining enough orders to revive the depressed business is generally doubted.

Alumina from Clay

The discovery of a method of producing alumina, the original material for manufacturing aluminium, from clay has been made by Mr. Hiroshi Tanaka, attached to the department of agriculture and commerce.

During the great war, when the supply of alumina from America practically ceased, scientists in Germany made great endeavors to discover a method of production, but of no avail. Alumina has hitherto been produced from a mineral in America by means of electrification, and the majority of the world's demand has been supplied from the United States.

Aluminium is now in great request for use in various capacities, and should the aforementioned discovery be practicable, its contribution to the industrial world will be a great one.

Osaka Electric to Install New Equipment

The Osaka Electric Company was ordered by the government communication bureau in Osaka, under date of July 17, to repair completely its electric equipment, up to January 16, 1923. The government bureau after a thorough investigation conducted in the plants of the company found that among 25 other defects, the insulated copper wires were insufficient to cope with the power transmitted, and decided to issue the order. Instructions to the effect that such an order was issued were received by the public safety section of Osaka prefecture on July 23.

The Far Eastern Review

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ENGINEERING . FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, AUGUST, 1922.

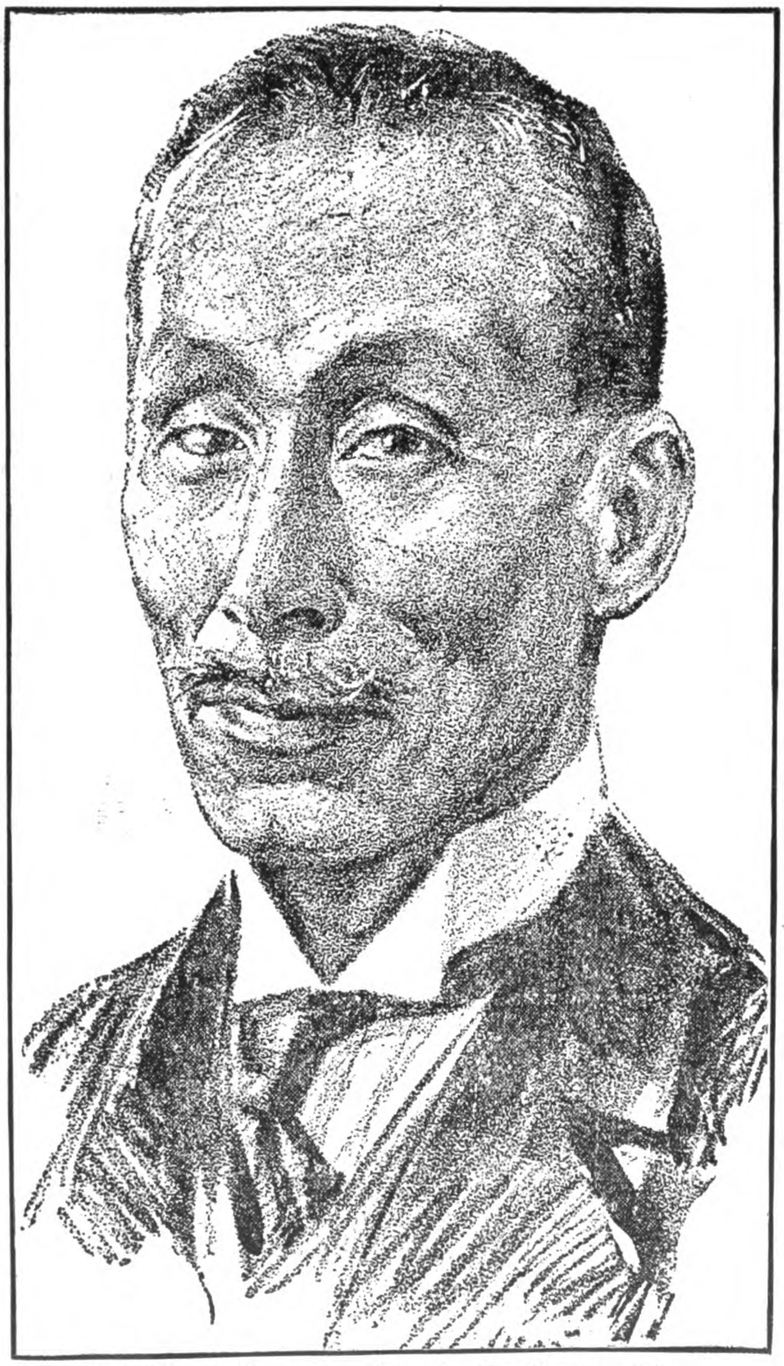
Kato

ADMIRAL Baron Kato has succeeded to the position and policies of Hara and Takahashi. A fighting man, he is an advocate of peace; a militarist, he is opposed to an aggressive foreign policy and the control of the government by his own group. He insists upon restoration of friendly relations with China and has placed into effect policies calculated to bring this about. Kato intends to keep the pledges he made in the name of Japan at Washington.

Kato, the man with the ideal poker face, won the hearts and esteem of the American newspapermen. He is now living up to his promises, making good his words by deeds. The American press is with him. With hardly a dissenting voice, the editors of America are acclaiming Kato as the safest and best bet for those who hope to see the resolutions of the Washington conference carried into effect. The new premier of Japan has made a great hit with America; a tremendous asset for Japan in world affairs.

Kato accepted his new task on the explicit understanding that the army budget should be reduced by Y.40,000,000 and a policy of retrenchment adopted all along the line. The garrisons at Hankow and Tsingtao and the Shantung railway guards and troops in North China have been recalled. Siberia is to be evacuated. Japan is placing into practice the resolutions arrived at in Washington, getting down to brass tacks, by retaining only such guards in China as are necessary to guarantee protection to the South Manchuria Railway.

The accusations that Japan was deliberately building auxiliary ships to neutralize the 5-3 ratio has been refuted by the official announcement that her naval building program calls for four new cruisers of 10,000 tons and five of 7,000 tons, besides 24 destroyers with an aggregate of 33,000 tons and twenty-seven submarines with an aggregate of 28,116 tons. Port Arthur is to be abandoned as a naval base and 12,000 line and non-commissioned officers are to be dropped from the Japanese naval lists. The Washington treaties have been ratified.



Admiral Baron Tomosaburo Kato, the New Premier of Japan
(The New York Times)

Militarism in Japan is becoming more and more unpopular. It is true that the military leaders are still powerful but the time is not long distant when the rising tide of liberalism will sweep them into their proper place. A change has come over the viewpoint of the young men of Japan. They avoid the army, evading military service by every subterfuge to seek their careers in the professions, in commerce and the government service. Military men as husbands are a drug on the matrimonial market. Relieved of the strain of maintaining a huge army and navy for defensive purposes, Japan is living up to the declaration of Kato at Washington. "The Japanese," he said "had never in view preparation for offensive war."

Kato has become the outspoken advocate of international understanding and of concession to world opinion. He sees no profit in any course other than a sincere endeavor to retain the confidence of the rest of the world. Japan's foreign policy laid down by Hara adhered to by Takahashi, and from which Kato will not depart, is to co-operate with the powers in the spirit as well as the letter of the covenent of the league of nations and the treaties and resolutions signed at Washington, with the view that concord and friendship may continue and develop among the nations and that reduction of armaments may steadily progress to relieve the difficulties and burdens of mankind.

Kato, the grim chief of staff of the Kamimura squadron of Togo's fleet who laid his vessels across the bows of the advancing Russian battleships at Tsushima and destroyed them ship by ship, Kato, the expert responsible for Japan's naval expansion program that placed his country among the ranking sea powers, in order to demonstrate his good faith in America gladly signed and is carrying out the provisions of a treaty which relegates his past work to the junk pile. Kato could do this, as the navy he had built was designed to defend the island empire against a possible attack by the fleets of the United States. Once satisfied that America had no aggressive designs in the Pacific, Japan had no use for a big navy and Kato could gladly accept the 5-3 ratio.

With distrust turned into confidence and understanding, the road to co-operation between Japan and America is wide open. Japan is losing no time in getting into step with the United States, the greatest insurance policy she can take out that never again will she be called upon to burden her people with the enormous

taxation required to maintain a huge navy. The Japanese of the future will be able to look back with grateful remembrance to the men who rehabilitated Japan's good name at a time when such rehabilitation was a vital national necessity.

The names of Takashi Hara and Tomasaburo Kato will live in history as the men who placed Japan in the ranks of the liberal nations of the world, when the inside story of the struggle between militarism and liberalism in that country is written other names will be added to Japan's roll of honor.

For behind the premiers, cabinet officers, statesmen and diplomats of Japan stands a party of broad-minded financiers, merchant princes and captains of industry forming part of the Japanese group in the consortium, who have laid down the program their statesmen are now adhering to. It is fortunate for Japan, for America, for China and the peace of the world, that this group has men like Kato on their side. The outburst of sincere good-will from America on receipt of the news of Kato's elevation to the premiership of Japan, is a tribute not only to the gallant admiral, but to the group who, with implicit faith in the *bona-fides* and common-sense of the American people, staked their reputations two years ago on the outcome of a campaign for cooperation that led to the Washington conference.

* * *

The Vindication of Lobinger

AMERICANS will be glad that the charges preferred against the American court for China have been dismissed after careful investigation by the department of justice and that Judge Charles S. Lobinger is back again on the bench prepared to sit in judgement on the two hundred and some odd cases which have piled up during his absence. Owing to the existence of a suit pending in the American court for China against this publication, it has been difficult for us to express any opinion on the merits of this case. Although we repose the utmost confidence in the judicial honor and integrity of Judge Lobinger, we incline to the opinion that the time has arrived when some modification of the law that will give Americans a trial by jury is essential to the dispensation of American justice in China. THE FAR EASTERN REVIEW was one of the first to urge the creation of the American court for China and recognized that the exceptional conditions prevailing in Shanghai twelve years ago, called for arbitrary powers on the part of the judge in order to clean up the undesirable element in the settlement. Conditions are now different. Many American firms with vested interests have established themselves in China. The undesirables have gone, and there is no longer any excuse for the continuation of a system that deprives Americans of their constitutional right to a trial by jury. Up to the present, Americans have been most fortunate in the judges appointed by the president to preside over the court in China. We may not always be so fortunate. It is no reflection on the judicial capacity of Judge Lobinger for Americans to plead for the institution of a system that would have relieved him of the unpleasant experiences of the past year.

The outcome of the investigations into the charges preferred against the judge is shown in the following executive order, issued by President Harding on June 23, entitled " Executive Order Dismissing the Charges Preferred by W. E. Fleming Against the Judge of the United States Court for China." It reads :

" A full investigation of the charges preferred by W. S. Fleming against the Judge of the United States court for China having been made, these charges are determined to be unfounded, and are therefore, dismissed.

" The judge of the court is hereby directed to return to his post of official duty at the earliest practicable moment.

" (Signed) WARREN G. HARDING."

This executive order was accompanied by the following personal letter from President Harding to Judge Lobingier :—

" THE WHITE HOUSE,

" June 23, 1922.

" MY DEAR JUDGE LOBINGIER,—I am enclosing herewith a copy of the executive order which disposes of the charges preferred against you as judge of the United States court for China. The record of the conclusion is filed with the department of justice. I trust you will make the earliest possible arrangements for your return to your post of duty and resume the sessions of the court. I should not be satisfied in sending you this notice if I did not say that in investigating the matter I have invited the fullest co-operation of the department of justice, and the decision is in accord with the views of that department, as I think to be becoming in view of its participation in the investigation.

" I wish for you a safe return, and a record of progress in the courts which will cure as far as possible the delay incident to the filing of charges and the inevitable delay in reaching the decision which the enclosed order conveys.

" Very truly yours,

" (Signed) WARREN G. HARDING."

The complete vindication of Judge Lobinger will stand as one of the highest testimonials to the integrity of the American bench. Americans have reason to feel a just pride in the dismissal of charges, which, if proven, would have lowered the national prestige in the eyes of other nationals in China.

* * *

Educate Chinese in China

THE campaign launched in London last year for the remission of the boxer indemnity still due to Great Britain, along lines laid down by the United States, raises the question of whether Chinese should continue to be educated abroad or trained in home colleges amidst surroundings and influences that will make them better able to cope with the problems of their own country. The argument that each student educated in Great Britain was not merely a consumer of British goods but also a rallying centre for them was used with great effect. In fact, the campaign was based solely on its beneficial effect upon British trade, a very potent argument at any time.

There was a time when such a premise had considerable force. That day is gone. Experience has demonstrated that on return to China, the graduate of foreign colleges drifts into official life where purchases of materials are governed by laws which he is powerless to modify. His preference for the materials of any one nation cuts little figure in the placing of the final order. In private life or business, the same rule holds good in another way. Squeeze or commission gives place to price and terms, and the nation that can meet the Chinese idea of what these ought to be, will get the order. The education of Chinese in American colleges has not created a preference for American materials.

The one benefit that would accrue to Great Britain from the education of perhaps two hundred students a year in British colleges, would seem to be political, counterbalancing the influence of American trained officials with their intense republican tendencies. The control of China's future development will be determined largely by whether the American educated official with his democratic leaning or the more conservative type educated in England is to come out on top.

The hope of establishing a stable constitutional government in China based on provincial autonomy with an elective president and parliament, can be attained only after years of domestic strife. The possibility of creating a constitutional monarchy, even with all the safeguards requisite for the protection of the liberties of the people will be opposed by the radical republican element. It is natural that the moral support and sympathy of Americans thould go out to those who accept their ideals, and it is just as natural that those who adhere to the constitutional monarchical theory of government should similarly encourage those Chinese who adhere to their views.

Neither of these systems have anything to commend them. Both are wrong, both difficult of application to China. The Chinese should be educated at home in his own environment. He should be taught to become a better Chinese citizen, fitted to cope with the peculiar problems of his own country and the needs of his people. A successful republic must come from below, from the education of the masses. The education of thousands of young Chinese in American colleges has simply turned loose a group of

advanced political thinkers whose ideas can only be grasped and placed in practice when the millions of China are educated to an understanding of the fundamentals of democracy. Turn loose in China another 2,000 or more graduates of British colleges and domestic politics will continue at boiling point for years to come.

The American-educated Chinese has contributed nothing towards creating a market for American goods in China. It will be the same with those who may be educated in British universities. Loan agreements and clauses in financial contracts will decide the origin of materials on all government contracts, and terms and price will control the placing of private commercial orders. If the consortium functions in the financing of Chinese railways, orders for materials will probably go to the lowest bidder. In other words, it is a mistaken idea that a foreign education will serve as a wedge for the introduction of materials manufactured by the nation educating the Chinese.

It would seem more to the point if China is to be permitted to forego the payment of the boxer indemnities in return for sending a certain number of scholars to the various universities of England, France, Japan, etc., that she should be required to put her own educational system on a sound basis, and the remitted funds employed to endow and create new schools in China. There is no good reason why the charitable people of America and Great Britain should continue to support colleges and schools in China from missionary funds while this huge indemnity is employed to send students abroad. There are already a number of educational institutions in China dependent for their sole support upon foreign missionary and endowment funds which should be more liberally supported.

Now is a good time to change the system. If the boxer indemnities are discontinued, China should give some promise that the funds so released will be utilized for educational purposes at home, and the indemnity apportioned out to worthy and needy foreign-directed colleges carrying the load of educating the Chinese youth to become better citizen, China should also be required to set aside an equal amount for preparatory schools under the direction of the ministry of education. The remission of the boxer indemnities without such guarantees, simply means so many more millions for politicians and militarists to divert to their own uses.

Are the British desirous of educating the Chinese to become purchasers of British-made machinery and tools? There is the Hongkong University, with an engineering school equal to any at home and large shipyards and industrial plants in the colony where the graduate can obtain practical experience in the use of British specialties. There is the Canton University for Americans who wish to have their ideas inculcated in the young Chinese mind. There are numerous other institutions doing a noble work preparing the Chinese for a life work of usefulness in their own country. These schools have the first claim on the beneficence of foreign governments who may desire to forego their share of the boxer indemnity. Educate Chinese in China.

* * *

The "Amende Honorable"

TWO years ago, the American secretary of commerce directed a formal letter to Admiral Benson, head of the United States shipping board, in which he accused the Japanese of tampering with, damaging and intentionally delaying American cargo consigned to the Orient in Japanese bottoms. These charges constituted a public and official denouncement of the port of Kobe and were based on the mass of reports emanating from American concerns who saw in each delay, each broken crate, each pilfered box, evidence of a set determination on the part of the Japanese government and ship-owners to ruin their trade with China.

Conditions have changed. Investigations have brought out the truth and while not entirely exonerating the Japanese from the charges of carelessness in the handling, storage and safe-keeping of cargo, the facts fully vindicate the Japanese government and steamship companies of any conspiracy or intent to willfully discriminate against or injure American cargoes entrusted to their ships for ocean transport. The new American administration has since had time to digest all the facts in the case, and compare the reports from the Far East with those from other parts of the world.

In a speech made to American business men in Yokohama, Secretary Denby referred to "the constant annoyances and impediments that ensue when our goods are carried under the flags of other nations." "Instances have been known" he added, "of the deliberate rough handling of American freight to prejudice foreign markets against it." This he characterized as "commercial treachery" and as designed to cripple the trade of a rival country. "*No such instances, I am happy to say, have I ever heard of in connection with the Japanese merchant marine.*"

There has been so much propaganda emanating in the Far East directed against Japanese shipping methods, that this official vindication was construed as an indirect indictment of the only other maritime power carrying American cargo across the Pacific. Without waiting for an explanation, British newspapers in China hastened to condemn the speech as a reflection on British shipping. The British chamber of commerce in Shanghai went so far as to direct a letter to the American chamber of commerce requesting an explanation.

As all these matters hark back to war days and at a time when American commerce was dependent upon foreign shipping, no good object can be served by reviving the stories of discrimination against American trade which deluged the department of commerce from all parts of the world. It is, or should be, a dead issue. The history of those days makes unpleasant reading for all trading nations.

The simple statement of Secretary Denby should be welcomed as a tactful withdrawal of the charges preferred against Japanese shipping and not as an accusation against other nations. Secretary Denby lived up to the purpose of his special mission to the Far East by making the *amende honorable* for the public indictment of Japan by a former American cabinet officer. There has been no propaganda in this part of the world against British shipping methods.

To assume that exoneration of Japan implies an indictment of Great Britain, and that an American cabinet officer should be called upon to explain his statement for the satisfaction of other national interests, would seem to create a precedent that can only lead to regrettable misunderstandings. American trade encountered many difficulties previous to the entrance of the United States into the war.

The average American was extremely good-natured about these interferences with their legitimate trading rights. Even after America had entered the war her trade was largely at the mercy of those nations which had the ships to spare. Americans didn't complain very much about the manner in which their shipments were handled, but took to heart the lesson that was drummed into them. They built their own merchant marine, and with it a navy of sufficient strength that would assure for the flag the respect that had been denied to it in the earlier stages of the great war. They intend to maintain that merchant marine, even if they go broke in so doing. American friendship with Great Britain stood the test. The account is closed. Secretary Denby closed the account with Japan in his speech at Yokohama. What happened to American trade during the years of the great war, will never happen again. Americans hold no grudges or hard feelings. They are under deep obligations to both British and Japanese for tuition in the rudiments of ocean transportation. The lesson works both ways. Our British friends should ponder over this and let it go at that.

Hands Across the Pacific

WHEN the Japanese delegation started on its memorable voyage to Washington it was preceded by a business men's mission composed of some of the brightest and best of Japan's liberal element. While the diplomats were making friends in Washington the business men were meeting their American colleagues in friendly intercourse and driving home their fervid hope that a better understanding would take the place of the suspicion that existed at that time. At the head of this party was Dr. Takuma Dan, one of the pillars of the Mitsui interests. How well they performed their mission and backed up their diplomats is now seen in the following letter of resolution signed by 38 noted American business men and newspaper proprietors. The heads of the *Associated* and *United Press* services, the editors and proprietors of the *New York Times, Evening Post, Herald, World, Public Ledger, Boston Herald* and *Saturday Evening Post*, and leading financiers and captains of American industry have stretched forth their hands across the Pacific to clasp those of their colleagues in Japan, an assurance of an enduring friendship that will lead to bigger and greater things.

The original of the letter was written on parchment and signed by each of the thirty-eight persons. It is a historical document marking the opening of a new era.

December 9, 1921.

Dear Dr. Dan.—We feel that we should tell you of the pleasure and privilege it has been to us to have met in friendly intercou se you and your distinguished colleagues of the Japanese Business Men's Mission.

Your visit to the United States has been most timely and in the highest sense helpful in giving further impetus to the long-time cordiality and understanding between our two countries.

Your openness and frankness in making clear your desire for continued amity and co-operation between your people and our people, always our own cherished wish, have quite won our confidence and our hearts

We want to take with you to Japan the assurance of our steadfast friendship, and our hope so to work with you and your countrymen as to foster industry, commerce an . lasting tranquility in all the Orient, and to promote peace in the world.

Dr. TAKUMA DAN,

Chairman, Business Men's Mission.

Signers of Testimonial

Japan Society, by Henry W. Taft, President; E. H. Gary, Chairman, U. S. Steel Corporation; Standard Oil Co. of New York, by H. C. Folger, President; General Electric Co., E. W. Rice, Jr., President; C. A. Coffin, Chairman; Westinghouse Electric & Manufacturing Co., E. W. Herr, President; J. P. Morgan; Mortimer L. Schiff, Kuhn, Loeb Co.; The American International Corporation, by F. A. Vanderlip, Chairman; Radio Corporation of America, O. D. Young, Chairman; American Locomotive Co., Andrew Flecher, President; Melville E. Stone (Associated Press); Louis Wiley *(New York Times)*; Allan Dawson *(New York Tribune)*; John Palmer Gavit *(New York Evening Post)*; Frank A. Munsey *(New York Herald)*; W. M. Hawkins *(United Press Association)*; Frank I. Gobb *(New York World)*; J. P. Morgan & Co., Thos. W. Lamont; Darwin P. Kingsley, President, Chamber of Commerce of the State of New York; Gerard Swope, President, International General Electric Co.; Edwin Morse, President, Boston Chamber of Commerce, Treasurer, Massachusetts Institute of Technology; C. F. Weed, the Frist National Bank of Boston; Cyrus E. Dallin, President, Japan Society, Boston; Robert Lincoln O'Brien *(Boston Herald)*; Alba B. Johnson, President, Philadelphia Chamber of Commerce; S. M. Vauclain, President, The Baldwin Locomotive Works; N. B. Kelly, General Secretary, Philadelphia Chamber of Commerce; J. G. Brill Company, Sam'l M. Curwen, President; Public Ledger by Richard Spillane, Business Editor; *The Saturday Evening Post*, Geo. H. Lorimer, Editor; First National Bank of Philadelphia, Wm. A. Law, President; I. Franklin McFadden, Honorary Consul of Japan, Philadelphia; Marcus Rauh, President of the Chamber of Commerce of Pittsburgh, Pa.; Aluminium Co. of America, Arthur V. Davis, President,; The Union Trust Co. of Pittsburgh, H. C. McEidowney, President; The Carnegie Steel Co., H. D. Williams; Pittsburg Plate Glass Co., W. L. Clause, Chairman.

So ends the campaign for harmony and co-operation. America and Japan have been brought into a close understanding. The pendulum has swung the other way. It may swing back, but not in our day, nor while such representative American names as the above have any influence in directing the policies of the United States. The names of the Japanese delegation headed by Dr. Dan are a guarantee that the pendulum will get stuck when it reaches its highest point and will not swing back.

* * *

Crisp and the Consortium

AT a general meeting of the British bank for foreign trade, Mr. C. Birch Crisp found occasion to condemn the new consortium along lines which proved so successful in 1912 when he succeeded in floating the first half of his £10,000,000 independent loan with the Peking government. The campaign of villification indulged in by the original promotors of the Crisp loan to influence public opinion in China against the sextuple group was one of the vilest that ever disgraced the profession of journalism. Headed by a subsidized Chinese government organ in Shanghai, and echoed by a section of the British press at home, the campaign against the consortium reeked with abuse of the British government and the British corporation that had so successfully carried the brunt of the financial battle for the advancement of British trade and prestige in China. It even went so far as to openly insult the American minister, one of the highest types of incorruptible American diplomats that our country has produced.

Mr. Birch Crisp's loan was sold to the public at 95, the bankers receiving 6 per cent. commission and the Chinese government 89. Subsequent events brought out the fact that the inside clique (in which figured the editor of the *National Review* and his Chinese partner, a high official of the Chinese government and close friend of Yuan Shih-kai) received a commission of 1½ per cent. as intermediaries. The squabble over the division of this part of the spoils was finally brought before the British courts where all the facts surrounding the deal were made public in the evidence. It was an excellent piece of business for the promotors and underwriters, but it broke China's credit, undermined the value of her outstanding bonds and compelled the foreign governments to stand by the sextuple group.

The strongest argument in support of the present consortium is the very deal which brought Mr. C. Birch Crisp into the limelight of Chinese finance. The evidence of the existence of the 1½ per cent. inside commission or squeeze to the promoting syndicate of Chinese officials and their journalistic partners convicts everyone connected with the deal of betraying the interests of the Chinese people. If the door is now opened for the present Chinese officials to negotiate independent foreign loans, the result will be a repetition of such grafting practices.

Mr. C. Birch Crisp declares that British and American financiers outside the consortium combine are most anxious to see its strangle hold on China broken. It is quite clear that they can have little knowledge of the real facts surrounding the present state of China's finances. It is perhaps true that many a fat juicy loan could be marketed at this time by financial concerns whose reputation alone would enable the bonds to be sold to a trusting public. But we repeat what we had to say in our May issue on this subject. Any firm that would take advantage of the present conditions in China to negotiate an independent loan with Peking and who would place such bonds on the market would be guilty of a crime.

* * *

中國政府鹽務稽核總所

Trimming the Salt Gabelle

JUST imagine trying to do business with the Chung-Kuo-Cheng-Fu-Yen-Wu-Chi-Ho-Tsung-So. The name itself is enough to start something. Foreigners in China abbreviated it to two words, and the Chinese followed by trimming it until there is nothing left to its original meaning but a tradition.

First, Dr. Sun Yat-sen from the presidential chair at Canton, lopped off a word or so and crippled its honorable signi-

ficance. Then General Wu Pei-fu, straddling the Kin-Han-Lung-Hai railways at Chengchow, got tired of having all these ideographs staring at him as the salt treasure rolled by on its way to Peking, and appropriated another handful. Now comes the ruler of Manchuria, his super-excellency, Field-Marshal Chang Tso-lin, who says that the title as trimmed by Sun and Wu conveys no meaning at all and he will not have the beautiful classical language of the sages murdered in that fashion in the provinces under his control. So another batch of characters have gone from the title and only the words "Chung-Kuo" remain, and even the 中 will not stand up straight.

For editing the ponderous title, Sun was acclaimed a patriot: Wu, a scholar and a gentleman, the "Hope of China." Chang Tso-lin was also acclaimed as (this being an engineering magazine, we adhere to technical terms) the name the old Scotch engineer hurls at the boob who drops a monkey-wrench into the machinery. There was also great hopes expected of Chang, and again it would not be polite to put into plain English just what these hopes led to.

For the array of ideographs at the head of this article, is the Chinese official name of the jolly old salt gabelle that provides the surplus which makes the financial wheels go round in Peking. It has been trimmed, and trimmed, and trimmed until all the surplus has been trimmed off. Even the dashes have disappeared and Chinese bondholders have coined a name of their own for it that has to be edited and expressed by a type case full of asterisks.

The associated legations mildly expressed their disapproval when Dr. Sun started to mutilate the beautiful title. They vigorously protested when Wu Pei-fu tampered further with the classics, and are now "banging the table" right violently in order to emphasize their anger at Chang's contempt for ideographs which in former days would have caused him to tremble and *kowtow*. Chang simply has no regard for the proprieties of high-sounding diplomatic official titles and his brusque deletion of superfluous characters takes the surplus out and leaves hardly enough salt in the gabelle to season outstanding bonds. There is no salt left for future coupons.

"We should worry," answer the Chinese. "The friendly powers have provided us with a fine substitute to take the place of the trimmed-to-death-salt-surplus. We will soon have the increased customs duties, and this will come under the supervision of the Tsung-Shui-Wu-Ssu-Kung-Shu." This, they admit, is difficult to trim. But one never can tell what may happen to these long Chinese names when military purists in the various provinces start to abbreviate them. On the very face of things, this title is also too long. It needs editing. In this case, the title translates into the high-sounding words of "The Inspectorate-General of the Chinese Maritime Customs."

A word to the wise should be sufficient. Experience is the best teacher and to avoid tampering with this name on the part of uniformed exponents of Chinese classics, the legations should engage a good strong arm editor and cut that title down to the "Chinese Customs," or just plain "Customs." Stop and think what trouble would have been averted had such a man been on the job when the salt gabelle was christened in Chinese. For, as sure as fate, when the increased customs revenues goes the way of the salt, wine, tobacco and other securities, another handful of ideographs will be added to the Tsung-Shui-Wu-Ssu-Kung-Shu, and unless the powers maintain a squadron in every treaty port and a brigade at all frontier posts to protect the purity of the Chinese classics, some swash-buckling, sword-rattling scholar is bound to trim the customs in the same manner as they trimmed the surplus out of the salt gabelle.

* * *

Gee! What a Wad!

IT was not very long ago that Lord Northcliffe poured out the vials of his wrath upon Japanese propaganda. Now comes the Duke of Northumberland and charges Mr. Lloyd George with having corrupted the British press by conferring titles on 49 men who control important newspapers of the British empire. The descendent of a long line of belted earls probably resents the elevation to knighthood of scriveners whose pens are now mightier than the sword, but the days are past when the soldier, courtier, and sycophant can monopolize the honors of a nation. The British premier showed excellent judgement in honoring those journalists whose work during the war overshadowed the labors of many who earned titles for executive, civic or other virtues. If the Germans are correct in declaring that British propaganda destroyed their *moralé* and paved the way for the armistice, the distribution of a few titles was little enough reward for those responsible for bringing this about. In conferring knighthood upon such newspapermen as Phillip Gibbs, Percival Philipps and others, the king and premier of Great Britain honored the entire profession of journalism. It was a small recognition for strenuous and excellent work rendered the empire under the most trying and hazardous conditions, work, that in the end, undermined the efficient propaganda of the enemy and destroyed their confidence in themselves. American journalists rejoiced with their British colleagues when such men were singled out for knighthoood. Northumberland's grouch won't get much of a raise out of American editors.

We turn now to another film and we have before us on the screen the picture of a British adviser to the Chinese government lifting the curtain on the inside working of the Chinese propaganda system.

It appears that extreme hard times compelled the ministries of finance and communications and the salt administration to suspend the subsidies hitherto paid to Chinese and English newspapers published in China. According to well-informed newspapers of the Chinese capital, this economical necessity got on the nerves of a distinguished British adviser to the Chinese government, himself a well-known writer and journalist, who at once repaired to the palace and prevailed upon the president to have the payments resumed. One Peking newspaper (apparently not in on the graft) states that under the *régime* of Pan Fu as assistant minister of finance, these subsidies amounted to the sum of $125,000 per month, which, we assume must have covered all the domestic and foreign propaganda expenses of the Peking government.

A meeting of the Chinese press union was held in Peking to discuss the question of the suspension of subsidies, in which the members were informed of the activities of the British adviser in their behalf and of his declaration that such subsidies were eminently proper, being compensation for services rendered and if the government remained obstinate, he hoped the Chinese newspapermen would make a proper expression of their attitude towards the matter. The assembled journalists acting upon the advice of the gifted writer, thereupon threatened to act as strict supervisors of all acts of the government and to withhold all news concerning its activities, unless the subsidies were quickly restored.

As one newspaper in Tientsin puts it, "between this attitude and that of the blackmailer, burglar or highway robber there is no moral difference." Quite so.

A million and a half a year in press subsidies will help to explain many things. Next to being a *tuchun* or a general the best job in Peking would seem to have been the owner of an organ or the publicity agent of the powers-that-be. No wonder there was no money for other purposes. We have heard much about Japanese propaganda, but stand amazed before the supreme nerve of the Peking publicist, who with one hand in the treasury, has been hurling anethemas against all who hold opposite views. One million and five hundred thousand beautiful silver Yuans! Gee! What a Wad!

Sun Yat-sen

MALIGNED, slandered, misrepresented and hounded by a bitterly hostile press, Dr. Sun Yat-sen, the exponent of Chinese liberalism returns once more to his house in Shanghai, the victim of base treachery on the part of a swash-buckling militarist who stabbed him in the back, usurped his position and forced him to retire from Canton. The propaganda directed from Peking which has lauded Wu Pei-fu to the skies and denounced, defamed and abused the leader of Chinese democracy, has accomplished its purpose. Treason, ingratitude and disloyalty have been extolled as patriotic virtues in order to justify the betrayal of the man who stood in the path of Wu Pei-fu's ascension to the post of dictator.

It is difficult to understand what is behind the campaign to destroy the usefulness of China's foremost liberal. The defamers of Dr. Sun Yat-sen concede his honesty of purpose, his integrity and unselfishness. What higher qualities are desired in a political leader ? Is there another outstanding figure in China of whom the same can be said ? If there is one thing above all others needed in the reorganization of the Chinese government, it is HONESTY. Better an honest and untried executive, than an experienced grafter.

Is Dr. Sun an idealist ? Does he incline to socialism ? Has he a swelled head ? Does he talk big ? Well, there are, and have been in the past eight years, leaders that the western world has placed high on the pedestal of fame, of whom all these things can be said, and more. Dr. Sun is not alone as an idealist, he is not the only leader with socialistic tendencies, there are others who have communed alone with the Almighty and thought the future of the world rested in their care. Is Dr. Sun impractical ? The accusation that he is, dates back to his railway scheme which failed, not because of Dr. Sun's inexperience, but because of the meddling in China's affairs by impractical, idealistic and swell-headed foreigners. No honest financier or engineer has ever called it impractical.

What then, is the matter with Dr. Sun Yat-sen ? He is "a revolutionist," the "Mazzini of China," a "stromy petrol of politics." Admitted. But we add that any self-respecting Anglo-Saxon true to his blood and traditions would also have become a confirmed rebel against conditions such as have prevailed in China since Dr. Sun handed over the republic he founded to the arch-militarist, Yuan Shih-kai, the father of the present system of unbridled graft and oppression. For much less provocation violent revolutions have broken out in other countries.

When, in heaven's name, is rebellion justified, if not in the face of present conditions in China ? How long must a people see their constitution fluoted and trampled upon ? How long must they bear the yoke of a military despotism before rising to assert their rights ? The time must come when some leader will arise and if necessary call in foreign assistance to restore the liberties of the nation, even as the people of England invited William of Orange to save them from the despotism of James the Second, and the American colonists accepted the aid of France in order to preserve their liberties against the oppression of George the Third. Is Sun Yat-sen to be condemned because he has exercised that right to rebel which becomes the duty of all right-thinking and honest men when deprived of their liberties by despots ?

We hold to the conviction that if the constitution is to prevail in China, if a duly elected parliament is to function and the armed forces of the nation subordinated to the civil power, then this great step forward along the path of liberal government will never be taken by a dyed-in-the-wool militarist. If democracy is to triumph, if peace, happiness and justice is to prevail in this unhappy country, it will come only through the sacrifices of some idealist, some constitutionalist, revolutionist, some Mazzini, that history will call a great patriot. That honor we firmly believe is in store for Dr. Sun Yat-sen.

We know these opinions are unpopular in China, but we also believe that once the propaganda against Dr. Sun is terminated and people permitted to get a proper perspective on all that he has accomplished, that justice will be meted out to him. To our mind, despite all his shortcomings, all his errors--and they are many—he stands head and shoulders above the leaders of the Peking mandirinate whose inefficiency, corruption, self-seeking and trampling upon the rights of the people has fully justified his various attempts to restore parliamentary and popular government.

* * *

The Effect of Civil War on China's Railways

(Contributed)

CHINESE commanders cannot or will not understand that single line railways have to be run with the greatest care to avoid accidents, and it is little short of a miracle that they have so far had none as a result of their playful habit of running successive trains without staff or tablet.

Of the above statement, which appeared in local press report, it may be said that the half was not told, that the Chinese general is not so much at fault as his underlings, and that the extent of the miracle is not confined to insane infringements of traffic regulations.

The high officer in the present war has given every assistance to ensure proper working of the traffic, but generals or officials of sufficent rank cannot be stationed at every wayside station whose proper supervision is vital to proper operation of the line. Even if China were not a stronghold of nepotism and a prey to the sinecure holder, delegation of authority to men of deficient education and intelligence is inevitable at present. The bucolic relatives of the country-bred concubine and the sophisticated by heavy-eyed decadent who owes his position to "services rendered," are not calculated to make efficient railway traffic officers.

The railway machine itself suffers from the same defects. Only the foreign traffic official can flourish Chang Tso-lin's or Wu Pei-fu's visiting card in the face of the man with the Mauser pistol with any hope of success in argument. You can be armed with a proclamation signed by the Lord of All threatening death to the disobedient, and yet fail to eject three coolie soldiers from as many cars which have been converted into convenient bijou residences for a period of weeks.

In an army where mobility of responsibility is thoroughly understood and only a very local obedience is exacted, the written word is of no avail. You are only shot at dawn if the displeasure of your immediate overlord is incurred. Thus it is, that regulations are tolerated when there is no special urgency and thrown to the winds at times of stress. In retreat, or at times of urgent concentration trains are run on single lines at dangerously short intervals, entailing the suspension of all traffic in the opposing direction. Then, when the inevitable congestion occurs, some gilded one cries, Hold ! Afterwards, long afterwards as time is measured in the west, the railway undergoes a period of convalescence, during which the clotted rolling stock (the two-mile long processions of engines and cars) is broken up and reshuffled, not for the use of merchants on the brink of ruin, but to await the pleasure of the fickle-minded militarist who clings to it as he does to life or the pay of his men. This reorganization is perhaps carried out in the intervals between the local commander's naps when opium's wondrous dreams would be disturbed by the shunting of his saloon car, which, in all probability, blocks the main line. At length the railway creeps back to the anaemic life of perhaps a train each way per day, all that is possible with war's demands on rolling stock.

A railway is not generally considered a very fragile piece of mechanism. Nevertheless it demands common sense attention to avoid disaster. Thus drivers and firemen must have rest, a hot axle brooks no neglect, it is manifest unwisdom to grossly overload a car with ammunition, and still greater foolishness to marshal that car near an engine or next a fodder laden car on which cigarette-smoking soldiery loll at their ease. Yet these and many

other obvious precautions are wilfully neglected unless a foreigner observes them and insists on attention. That providence which protects the ignorant and incapable has miraculously befriended the Chinese armies. Their luck should become proverbial.

One would think the soldier incapable of doing much harm to the open cars in which he usually travels. However, he does his best, by cutting away the sides when doors are not wide enough for his needs, or by making firewood of the doors, while he elects as a rule to light his cooking fires on the top of a fuel laden car.

Occasionally the soldier revels in the superior comfort of a coupé car with upholstered seats. The trouble may start with the investigatory bayonet, or the wrench at parting with his comforts. The result is always the same; most of the car goes with him. The leather covers, the horse-hair stuffing of the seats, all brass hooks, ash trays and rack rails accompany him. He even attempts to pick the expensive plate glass windows out of their frames, and invariably smashes them in the hastiness of ineptitude or the rage of frustration. The car is left a smoke and grease begrimed shell, filthy in the extreme, verminous, redolent with the rancid oil of meals either cooked on the coupé floors on primitive charcoal stoves, or even on a chimney-less brick stove erected on a linoleum floor. Who is to blame? Certainly not the soldier, who brings with him the primitive habits of the dank, dark hovel on whose never cleansed mud floor he once wallowed with the family pigs and a bundle of evil smelling rags afflicted with a Job's collection of skin diseases for which dirt alone was responsible. Naturally he pockets everything that is portable or strange with a view to its sale or conversion into something to serve his simple needs. The bull in a China shop is not more expensive or more out of place than the coolie soldier in the luxury of a modern passenger car.

The financial effect is even worse. The earnings of the Peking-Mukden Railway in 1919 amounted to some $1,600,000 (£200,000) per month. The railway has been practically paralysed for six weeks. Moreover, its earning power has been greatly reduced for an indefinite period. Something like one-quarter of its revenue is derived from the carriage of some four millions tons of coal annually from the mines district to the sea. The rolling stock is therefore principally concentrated in this area. Chang Tso-lin in his retreat, took with him into the comparatively unproductive Manchurian regions, 120 main line engines out of a total of 140 and the bulk of the rolling stock, thus leaving the mining area in a hopeless position as regards transport. Of the 10,000 or more tons which can be produced daily, the railway can now move only 2,000 tons if unhampered by troop movement. The mines are thus compelled to pile up output as long as storage space is available and then close down until-long-drawn-out negotiation secures the return of locomotives and wagons which will than need a further idle period in the shop before being fit for service.

Further, there has been the usual top-to-bottom reorganization of government by the victorious party, in which well-tried permanent officials have been supplanted by new men. This, of course, cannot fail to have its effect on the machinery of railway administration. The permanent official is an unavoidable part of efficient management. Office lore, the wisdom of experience, a knowledge of the files, and the dusty contents of pigeon-holes, are very necessary when these repositories were until recent times the haphazard holes of a mud-walled palace.

Railways protected from war damage by treaty are somewhat of an anomaly, but this is the case as regards the Peking-Mukden Railway within the province of Chihli. By the railway agreement incorporated in the protocol of 1902, China is forbidden to keep troops within certain specified areas, must confine hostilities to a zone distant at least two miles from the railway and not damage the line as to cause traffic interruption for a greater period than 48 hours. Further prolonged suspension of normal traffic is forbidden between Peking and the sea, and to ensure this, a train under the protection of the troops of the treaty powers circulates in this district.

With the exception of an ineffectual attempt to blow up a bridge these somewhat exacting conditions have been observed with care, but a tremendous amount of minor damage has occurred, while trenches have been dug right up to the tracks an infringement of treaty conditions as regards war area limitation.

The war has reduced the number of military autocrats by one which is a step in the right direction, but he would be bold who would prophesy the dawn of that era of profound peace and rigid but wisely directed economy which is absoultely necessary for China's regeneration.

* * *

The Diplomatic Status of Famine Relief

By Laurence Impey

IN the first place it is necessary to consider the origins and presumable intentions of famine relief, past and present, in relation to its uses in China. In the past it may be said with every appearance of truth that the funds raised for famine relief came from purely exterior sources and were in the minds of the donors to be devoted to direct famine relief, that is, the provision of food and clothing for the absolutely destitute.

It has gradually become apparent to those on the spot that this is a mistaken principle to apply, inculcating, as it does, the lesson of pauperism and in its place, there has been developed the theory of labor-giving relief. This is well illustrated in the famine of 1920-1921, in which I was myself employed, where the American red cross China famine relief and the international famine relief committee were both at work in the same field, one employing the theory of more or less free relief and the other giving no relief except for work of national importance carried out, on one of their construction schemes. By this time, however, the sources of the funds used, differed from those of the previous famine eras and it is necessary to consider these sources next.

The American red cross funds, as of old, came purely from outside and were thus entirely at the disposal of a foreign committee, which decided to have them handled entirely by foreigners and on a constructive basis.

The international funds, on the other hand, were partly from foreign sources, partly from foreign and Chinese subscription in China and also partly from funds allocated from a surtax on the customs and on the telegraphs, Chinese organizations, though in one case under foreign and diplomatic control. Therefore it may be argued, not unnaturally, that the Chinese should have some say in the expenditure of these funds and this was in point of fact allowed for by the election of a joint committee to the international famine relief. This, then, obviated any difficulty as far as they were concerned, during the period 1920-1921.

To consider next the position of the red cross, which had a scheme of road construction in several of the provinces, the expenditure on which amounted to something like $2,000,000 in all. This road construction was work on which the greatest number of famine sufferers or unskilled labor could be employed and it was chosen for this reason in preference to other schemes which were put forward. It was, however, necessary that a right of way for the construction of the various roads should be obtained, before work could commence, and it was obvious that the American red cross could not use foreign funds with which to purchase land in Chinese territory.

This difficulty seemed a very real one at the outset, but it was overcome by agreements made with the provincial governors on behalf of their provinces that certain Chinese funds should be allocated to this purpose and that all land required should be measured and purchased by agents and representatives of the civil governor.

I think I am right in stating that in neither of the two provinces in which I was personally working was this agreement carried into effect and I know that up to the time of the closing of the work in

the summer of 1921 this had not been done and the result was well nigh to being disastrous.

In two cases, agents of the authorities were going among the people and stating that they sympathized with them in this expropriation which they were forced to carry out, but that it was the foreigners who were the responsible parties and they themselves were powerless in the matter. If the reader will consider for a moment the state of mind of a small farmer, who was being rendered destitute by the seizure of the whole of his little plot of ground for road construction, he will be able to realize the possible state of affairs after the relief work closed down. This is stated thus in order to make the point as to the impracticability of co-operation with officialdom in such work and the dangers and difficulties which may be encountered by outside assistance.

In the famine of 1922 the American red cross took no part and the International famine relief committee dissolved and reconstituted itself as the international famine relief commission, with headquarters in Peking and branches in various provinces. The funds at their disposal were the surplus from the previous year and the customs surtax as before and the commission was again composed of a proportion of foreigners and Chinese. Direct relief and road construction have been again resorted to and on this occasion a third item, which was rejected by the red cross the previous year, has been carried into effect, namely the building of river dykes as a means of flood prevention. It is an undoubted fact that the dykes of the rivers of China are in a most deplorable condition, threatening destruction to very large areas unless immediately repaired. The old Chinese authorities who are responsible for this work seem determined to neglect it altogether, in spite of many warnings, and the result was to be seen in the devastating floods in the Yellow river, the Huai river and the Han river areas this year, which carried death and destruction for hundreds of miles. The point for our consideration comes in the expenditure of the funds. In road construction bridges may be said to be the only outlay which is not of a relief-giving character. In dyke work about fifty per cent. of the funds must be expended in the necessary materials for construction purposes. Then there is another point which might be raised.

Is it famine relief only to employ famine sufferers and only to repair dykes which have already broken and caused a famine, or can the work be applied to the repair of dangerous dykes, which will undoubtedly break in the future if not attended to and therefore cause a famine. It is a question in fact, of famine prevention *versus* famine relief and I must admit that my sympathies are strongly on the side of that old proverb which says "Prevention is better than cure."

On the other hand it must be admitted that this work is trenching on preserves which should of right appertain to a conservancy board and I think that ultimately it will be realized that in this lies the solution and the only solution, of the difficulty.

Let us then devote a few moments consideration to the possibilities of conservancy work and the difficulties in its efficient organization. In the first place it appears to be impossible to co-operate satisfactorily with the present official *régime* and it is certainly unthinkable that such work should be delegated directly to them without outside supervision and control where foreign funds were concrned.

Work of this nature must in the present state of things be provincial rather than governmental, having regard to the total lack of authority on the part of Peking, but on the other hand the only available funds come from foreign or governmental sources, which would indicate the necessity for foreign or governmental control.

It would seem, therefore, that any conservancy board at present constituted would need to have equal foreign and Chinese representation, the Chinese to be divided between nominees of Peking and the province concerned.

Secondly, the members of such board would have to be of the educated and modern type as opposed to the corrupt officialdom, in order that the board should function satisfactorily.

Thirdly, all persons employed on the work of construction must be properly qualified and not as in the past, ignorant and useless nominees of some high official.

One point which appears to me to be a little uncertain is this. If foreign funds are voted for such purposes by the famine relief commission, and foreign representatives sit on the board as their nominees, do not they to some extent approximated to representatives of other nations who are interested in such engineering propositions, as say railway construction, which has been placed more or less in the hands of the consortium for settlement and may not Chinese themselves choose to regard this assistance thus proffered as a violation of her sovereign rights ?

Part II

Accepting the suggestion of conservancy boards and road boards in theory for the purposes of discussion, it now remains to consider them from a technical attitude, and formulate the necessary work which they are best able to carry out. Road work has been pretty thoroughly explored as a famine project and the data acquired furnishes sufficient information for a working basis. The missionaries in the area concerned can supply recruiting agents who will bring in the famine sufferers and they can then be formed into gangs under their own leader.

A certain area of road construction can be alloted to a number of villages who are suffering, for it is better to keep the workmen within reach of their own homes, as on several occasions we found that riots resulted from the allocation of labor to a strange neighborhood, where the local people, perhaps themselves suffering, not unnaturally regarded it as an intrusion.

It is undoubtedly better to pay the workers in kind whenever possible, as it does away with most of the opportunity for 'squeeze,' though the handling of foodstuffs in such large quantities with the inadequate railway accommodation of China, is a matter of some difficulty.

With the exception of possible bridges there need be no contractors employed, if sufficient foreigners can be obtained to handle the workmen, either direct or with the aid of an interpreter; and this has not proved to be the case on conservancy work in the past.

The survey work necessary for the road construction is of a much less skilled character than that needed for river work and can be carried out in much less time, while it also admits of modifications in plan during construction.

Transportation is the chief difficulty, as it concerns both the commissariat department and the engineering department alike, one with regard to the feeding of labor, and the other as to his duties of surveillance.

Leaving road construction aside as being already sufficiently dealt with, let us devote some thought to the problems that first confront us in the matter of conservancy work.

In the first place a primary survey must be made, covering the whole area of the river basin with its tributaries and extending into the mountain ranges from which the flood waters are derived.

It may not always be necessary to trace the river right to its source, though this is desirable, but nice judgement will be required to decide at what point in the course of the river it is safe to bring and how much can with safety be neglected.

To refer to a particular instance, with which I am personally acquainted, the course of the Han river would need to be topographically considered at least as far as the first important range of hills, which may be said to more or less define its course up to that point.

This would mean a survey some six hundred miles in length, by one hundred in breadth and would take about six months to prepare at a cost of say one hundred thousand dollars. Dependant on this primary survey would follow a second survey, which would prepare plans of the course of the river on a large scale, only taking into consideration the area in the immediate vicinity of both banks. Soundings would have to be taken and cross sections prepared, together with a table of water levels at various points at all times of the year, in order that the volume to be handled

could be satisfactorily estimated. These further surveys would probably cost another hundred thousand dollars, this sum total of two hundred thousand dollars, should prove to be sufficient for all requirements and with the exception of the water levels, could be put through in a little over six months. Then there comes the question as to what is the best policy to form on the data acquired and here the advice of an expert is necessary.

From what I have seen of the Han river, I will hazard a few suggestions which would probably be found applicable to other rivers in China also. In the first place the perpetuation of the present irregular course of the river is only courting destruction and a straightening of the channel in many places is absolutely necessary and will, moreover, prove a great benefit to river navigation, particularly that of Chinese junks, which are dependent on sails and oars alone and which are held up at every few miles by an adverse wind at a fresh turn in the river. Whether to cut connecting canals, or whether to use dredgers with pipe lines to straighten the bends in the channel, or whether to use a combination of both, is a matter which needs further consideration than we can at present give it.

Next there comes the question of the dyke as at present constituted, and whether it can be used in some part at least.

The Chinese have unfortunately given it almost no foundation and the water has undermined it to such an extent in many places, as to render it very difficult to repair. Piles can get no footing and rock mattresses will not lie well on such a steep and shifting slope, so that it seems possible that it will be necessary to build anew behind the old line and thus ensure good and proper construction. Owing to the fact that piling, fencing, rock building, etc., are more or less skilled occupations, it has proved impossible to employ direct famine labor on it and a system of contracting for earthwork, pile-driving, rock bunding, wiring, etc., has been entered into. This does away with payment in kind and the giving of relief where it is most needed and a wonderful system of graft enters into the proceedings at once, which, as far as I can see, cannot possibly be avoided.

Then there is the question of local contractors *versus* outside ones, a question which has given considerable trouble this year, for the local contractors are quite ignorant of the recognized methods of drawing up a contract and can see no reason why their tender should contain their lowest price for the work, in fact it never does and as soon as they discover that they have not got the contract they come round and lower their prices to what figure they think will be acceptable. Again, they have no guarantee for penalty in case of absconding, neglect or unsatisfactory workmanship.

On the other hand the outside contractor from a large city, who knows something of the work and has a guarantor, is higher in price and also is regarded as a foreigner in the locality, so that his materials are stolen and his men are boycotted and food rendered very difficult to obtain.

Timber for piling and rock for bunding have to be purchased at a distance from the site and shipped up or down as the case may be and the transport of funds is no easy matter in an area which quite possibly will be infested with bandits.

Part III

Having considered some of the diplomatic difficulties in the past and glanced at a few of the engineering problems, I would like to put before my readers an outline of the future.

In order to do this I think I cannot do better than append the agreement which was drawn up and signed by the Hupeh international famine relief committee on the one side and the civil governor of Hupeh on the other and which related to the work carried out during the spring and summer of 1922, at Sze Tze Kow.

AGREEMENT

This agreement is made between the Hankow international famine relief committee and the board of finance of the province of Hupeh, for the repair of the levee at Chow Chia Chuai in the district of Tsung Chiang. The terms of the agreement are as follows:

1. The total estimate for the work is $100,000.00 Mex.
2. This amount of $100,000.00 is to be provided jointly by the parties concerned. (The money is to be deposited in some bank.)
   The money is to be paid into the bank on the following dates as follows: February, $20,000; April, 15,000; May, 15,000.
3. The money to be used for the levee work is to be paid in the first instance into the Bank of Communications.
4. The above appropriation for this work is to be under the joint control of both parties.
5. All payment vouchers are to be signed by both parties, otherwise they shall be void.
6. All the engineering works are to be under the joint control of both parties, each party appointing an engineer.
   The engineers are to consult as to the plan and progress of the work, in order that it may be carried out in the best possible manner.
   All the field force are to be hired upon joint consultation.
7. After signing the agreement both parties are to decide a definite date upon which to start work.
8. This agreement is made out in duplicate, each party keeping one copy.

Signed and Dated,
the 11th year of the Republic of China, March 20th.

This agreement sounds very nice on paper the first time that one reads it over, but on further consideration there are various points that present themselves for further reflection.

The first three paragraphs pass without discussion, but the whole difficulty is raised by the fourth and following ones.

The funds can conceivably be under the joint control mentioned, but in that case what happens if there is a dispute?

The vouchers can be signed by both parties, but what if one party declines to sign any particular voucher?

And above all how can you have two chief engineers on a job working in a sort of partnership?

Again, in practice it is difficult to hire your field force jointly.

What actually occurred in this case was this:

The committee placed all the funds in the hands of a firm of accountants who placed cashiers in the field.

The committee appointed an engineer who took charge in the field.

The engineer appointed all the staff through the committee and placed all contracts.

The government appointed a representative who was not an engineer and who knew nothing about engineering or accounting, but who fulfilled the functions of both on their behalf.

He recommended his brother as a foreman when he was already a contractor and finding the contracts were already tendered for he retired gracefully into the background, whence he emerged occasionally to nod his head sagely at the work and sign vouchers which had already been paid.

This scheme works perfectly well, but it hardly seems fair to the other side, if they had perchance any real desire to make themselves a force for good, instead of a nonentity.

Considering matters from this view point it becomes evident that:

1st. Funds must come from joint contribution.
2nd. The government very justly may expect to be represented.
3rd. In previous conservancy boards a foreign engineer has been found to be a *sine qua non*.
4th. The funds must be under foreign supervision, in a foreign bank.
5th. The board must be at least equal representation of foreigners and Chinese.
6th. A reliable firm of accountants must be employed.
7th. It is vital that every facility be given by the local authorities to the engineering parties on the work.

8th. No unnecessary posts or appointments must be created.

9th. The old corrupt system of dyke officials must be done away with.

These matters having been presented for the consideration of the reader, we will now turn to a short outline of what has been done, or is proposed to be done, for the future in the matter of the formation of a conservancy board, in the Han river area or the Hwai river basin, both of which have been worked on by representatives of the famine relief commission, during the past six months.

With regard to the Hwai river scheme, the Shanghai committee have definitely decided to provide a fund of $150,000.00 to enable the board to function and to appeal to the authorities and famine committees of Kiangsu, Anhwei and Honan, to allocate similar amounts to the purpose.

It has been recommended that some engineer of high reputation be secured to advise on the scheme and Dr. J. R. Freeman has already been approached.

Data is being secured from Chinese records to allow such engineer to form some preliminary opinion as to the nature of the work and the high water measurements of the flood of 1921, are already being registered to this end.

The proposed formation of the conservancy board includes the following :—

Military and civil governors of Kiangsu, Anhwei and Honan.

American, British and French Consul Generals, Shanghai.

American, British and French Consuls, Nanking.

Provincial assemblies of Kiangsu, Anhwei and Honan, one representative each. The executive committee to be composed of five foreign and five Chinese members and two co-operating treasurers be appointed.

The formation of the conservancy board as outlined above has been undertaken in response to numerous appeals from Chinese and missionary sources and the committee has placed it upon record that :

"Our sole interest is to prevent future famines and neither this committee nor the Hwai river conservancy board, nor any member thereof shall directly or indirectly have any interest in the reclamation of land, or in any land speculation, or any claim on reclaimed land, or any interest whatever in schemes pertaining to profit from this Hwai river work."

This seems to cover the situation very fairly and the only point of general interest that is not dealt with, is the question of obtaining funds in the future by taxation or grant, to enable the work to be carried forward, as the possible grants of $600,000.00 already mentioned, will only start the ball rolling.

To turn to the question of the proposed Han river conservancy board, the arrangements there are not so far advanced in some ways.

The proposal of the famine relief committee is roughly this :

To raise a sum of $300,000.00 to be matched by an equal sum from the Hupeh government, making $600,000.00 in all.

To take $100,000.00 for the expenses of an immediate survey of the area affected and to invest the remaining $500,000.00 at say 8 per cent. interest, the sum obtained to be devoted to the costs of overhead expenses and the staff salaries.

The Hupeh government are to be asked to raise $500,000.00 annually by taxation for expenditure and the governor on being approached, is said to view the matter favorably and to promise his support.

A joint committee is to control expenditure, but no arrangements as to an engineering staff have yet been made.

The American red cross is being approached with a view to the advancing of certain funds and in this case it is proposed to allot one-half the representation to the Hupeh nominees and one-quarter each to the red cross and the international famine relief committee. Either party may withdraw from the scheme with their share of the fund's on one year's notice thereof and these features complete arrangements as far as they have gone.

One point is worth noticing : in the 3rd year of the republic there was a Hupeh conservancy board in existance, with allotted funds of some two million dollars or under.

The question is what became of those funds, are they still in the possession of some bureau, or is the board no longer in existance ?

An awkward situation might conceivably arise, if the old board appeared after work had started and asked for a share in the proceedings.

If these difficulties in the way of both the boards can be overcome, the persons in charge of the negotiations can satisfy themselves that they have made a very noticeable advance towards the development of China, and put through one of the best schemes of relief that has been projected here or in any other country.

* * *

Opportunity for Mining Engineers in China

By H. Foster Bain

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THE opportunity for mining engineers in China is limited despite the widespread presence of mineral deposits. The current notion that China is a country of unlimited mineral wealth is hardly in accord with the facts. Many deposits occur and there is a wide variety of minerals present, but in a majority of instances the ore bodies are small and of such type as not to lend themselves well to modern methods of mining. Many of them can be mined better and cheaper by Chinese methods or some simple modification of such methods, than by those used in America. So far as number of opportunities is concerned, therefore, the future lies with Chinese rather than foreign engineers, which is probably as it should be.

The young Chinese, now studying engineering in America and Europe, will have abundant field for work, provided they recognize the needs of the situation, are content with the scale of operations that the character of the deposits require, and are content to build on old foundations. A limited number of engineers, foreign or Chinese, will find a field in exploitation on a large scale and by modern technical and business methods of a few metal-bearing deposits and in mining coal. Then a large and satisfactory field may be expected to develop as the country becomes industrialized. Indeed, coal is the one mineral of which the quantity present is at least as great as has been represented. Extensive fields are present both in the North and the South and coal of wide variety as to quality is present. The mining conditions are by no means easy, resembling those of Europe and our anthracite fields rather than those obtaining in most American bituminous fields.

An excellent start in the introduction of modern technology has been made especially by and under the guidance of a brilliant group of Belgian engineers. The present trouble with the coal business in China is that the market is limited and except for a few centres of consumption the demand is scattered over a wide territory. Such coal as is sold goes out in small quantities and, with inadequate and expensive transportation, the final cost is high. The per capita annual consumption of coal in China is approximately one twenty-fifth of one per cent. in contrast with five and one-half tons in the United States. The difference from a business point of view is obvious. It is to be expected that coal mining will increase in China and a moderate sized iron and steel industry is already fore-shadowed.

The resources of iron ore, so far as now known, are not of the order of magnitude that will support a large industry. In the far western provinces, the geology is such as to lead to reasonable expectations of finding really large bodies of gold, silver, copper and lead ores and there are other indications supporting this anticipation. In Manchuria and Mongolia, there are gold placers that may well prove of first order of importance, but the disturbed political conditions and the number of bandits, added to the inherent difficulties of climate and distance, have so far precluded even adequate exploration.

In Hunan, there is probably the world's greatest supply of antimony ores. A dominant position has been acquired by a Chinese company which is managed by a very capable Chinese engineer resident in New York. It is entirely possible that in the antimony market the Chinese will come to occupy the same relative position as international nickel does in its field or the American producers do in supplying the world's need for copper.

In general, China produces a wide variety of minerals, but, up to now, does not even supply the domestic market. Further development is called for, but, because of the small size of the individual mines and the fact that such ore bodies can be worked better by hand than machines, the exploitation of the mineral wealth of the country is likely to rest mainly with Chinese engineers. —*Engineers and Engineering.*

Tsingtao International Club; Opening Day, June 1st, 1922

INTERNATIONAL GOOD-FELLOWSHIP AT TSINGTAO

TSINGTAO has set an example of international goodwill and fellowship deserving of emulation in other parts of China, where various nationalities, like birds of a feather, flock together and Chinese and Japanese "go by themselves." Shanghai has its Union Club organized to bring all nationalities together, and in a way, serves as link of understanding with the Chinese, but for all practical purposes it may be called a "senior" or taipan affair, lacking the popularity which the club deserves.

It comes as an agreeable surprise to learn that Tsingtao has taken the lead in the establishment of an international club for friendly and social intercourse that has brought together Europeans, Americans, Japanese and Chinese. The local residents are justly proud of their experiment, with every member pulling together to make the club a real link of understanding. Seated in the centre of the above group is General Yue, Japanese military governor, of the territory now being turned over to China. The presence of other prominent Japanese officials, merchants and bankers with Chinese and foreigners seems convincing proof that whatever opinions may have prevailed against Japan three years ago, ill-feeling has been superseded by a more cordial spirit of good-fellowship.

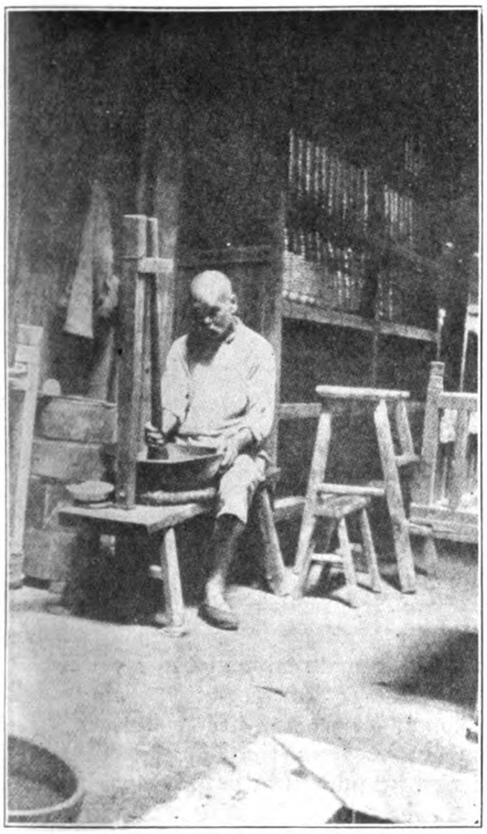
Chinese Kaolin for American Potteries

AMERICAN potters are looking around for a source of raw material that will permit a lowering of the high prices now prevailing for the finished product in the United States. Most of the *kaolin* imported into the United States comes from England and none from China. The cost of this clay has risen in England, according to quality and degree of preparation for the market by 139 to 225 per cent., in 1920 over pre-war costs which increase is reflected in higher prices to the American potter, and in the retail prices to the consumer.

While clay in its ordinary form is widely distributed throughout the world, the purest form—*kaolin*—is restricted in its occurrence in large quantities. In the United States the relatively few deposits of known commercial value are for the most part in the southern states, although California, Colorado, Nevada and Vermont, have important deposits and are producers of *kaolin*. It is probable that a thorough investigation would disclose large reserve *kaolin* resources in the United States. Even so, the question would arise as to the commercial value under normal conditions, that is, ability to compete in the domestic market with imported *kaolin,* for even the stimulus of the demand during the war, when American potters had difficulty in supplying their needs from foreign sources, did not result in a marked increase in the output of clay in the United States.

The fact that shipping and trade conditions and demand for special qualities of material may continue to cause the United States to bring *kaolin* from abroad, even though an ample domestic supply is available, should be borne in mind. Foreign *kaolin* was recognized as so vital to the domestic pottery industry that no order curtailing its importation was issued by the government during the war. However, during the summer of 1918 the British shipping authorities ruled that no clay could be exported from England to the ports of Boston, New York and Philadelphia in order to prevent congestion at these ports and leave shipping space available for other cargoes. This ruling was reflected in a marked diminution of imports from England.

This situation is turning the attention of American potters to other sources of supply and the department of agriculture recently sent out a special trade commissioner to make investigations. This gentleman, Mr. J. Morgan Clements, calls attention to the possibility of obtaining supplies of high-grade *kaolin* from China, and he believes that a detailed study of the *kaolin* deposits of China will result in the finding of deposits more favorably located to supply the markets of to-day than those now utilized in the ancient centres. In the interior of the province of Fukien, especially, there are several undeveloped *kaolin* deposits that appear promising in size and quality, and doubtless a search would disclose others more favorably located with respect to transportation than these.

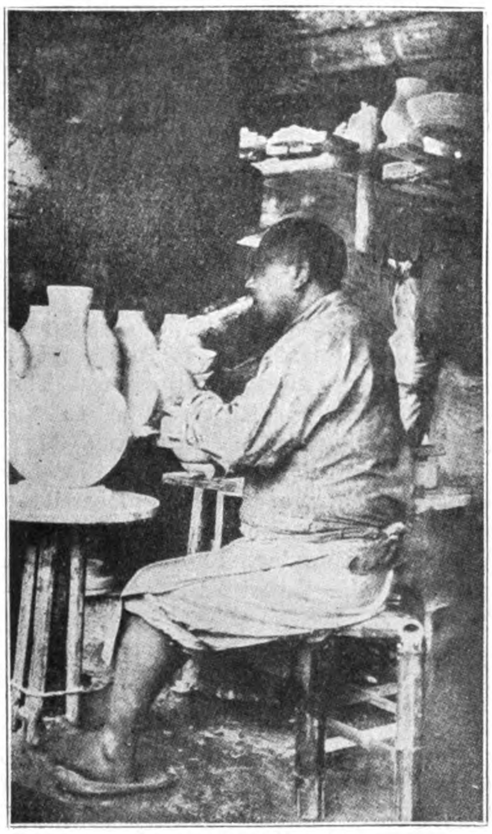


Mixing the Color

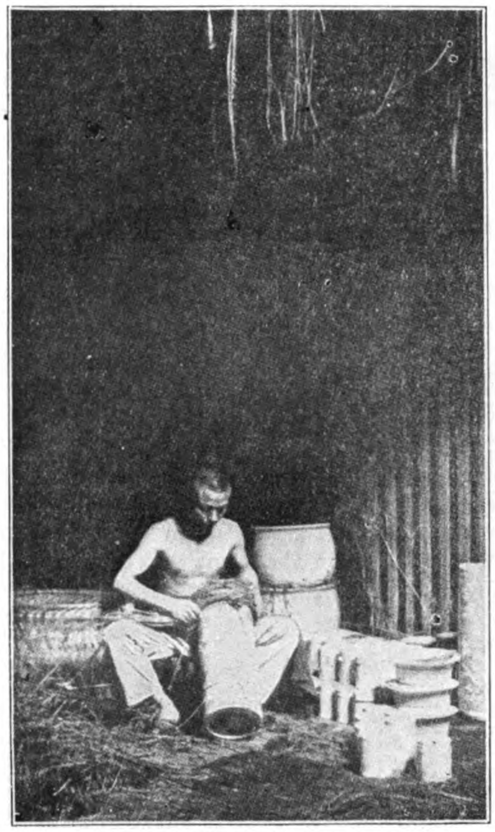
Pouring the Glaze

An Old Craftsman *(from "Asia")*

" The Chinese, so far as we know, first made porcelain during the Han dynasty, from B.C. 210 to A.D. 220. In A.D. 1004 the the Emperor King Teh established the imperial potteries at a place in the province of Kiangsi, south of the city of Kiukiang, on the Yangtze River, which received the name of King Teh Chen, and has ever since remained the chief centre of the ceramic industry of China. In the earlier centuries only white and colored porcelains were made, then about A.D. 1268 decorative painting of porcelain was introduced . In recent years potters of this district have begun to produce foreign styles of porcelains. There are reported to be somewhere around 150,000 potters employed. The clay from which the porcelain is made is, according to von Righthoven, a high-grade sedimentary clay.



Blowing the Glaze On



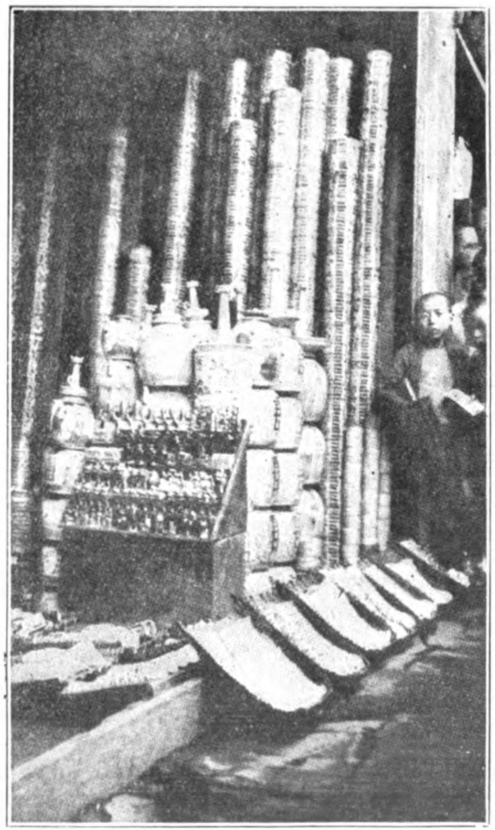
Packing for Shipment

In a Kingtehchen Factory (*from "Asia"*)

"The next porcelain centre of renown is Te Hua, in the interior of the province of Fukien, 50 miles due west of the coast city of Hing Wah. This centre has specialized largely in white porcelain statuettes, with other articles in white or with blue patterns, but has gone more recently into the production of foreign-style porcelain painted in various colors. Te Hua uses a high grade of *kaolin* which occurs in great quantity in the immediate vicinity.

"The third pottery centre is Shekwan, near Canton, in the province of Kwangtung. This is a comparatively new centre, the industry having been established there about 700 years ago. The highest grades of porcelain are not made in Shekwan proper, but are produced in Kochow, a small town in the same district. High-grade clays obtained in this locality are chiefly used, but it is stated that some *kaolin* is brought in. For a long time foreign shapes have been made here for the export market."

The best grades of porcelains are manufactured at the above three places, but ordinary pottery is made practically all over China, and in traveling in the interior one frequently passes through local pottery centres where earthenware bowls, teapots, vases, cuspidors, etc., are produced. All of the most important plants in which the highest-grade wares are made and which use the best grades of clay and *kaolin* are situated in southern China in the great area south of the Yangtze river. In many respects this area is comparable with the area embraced in the southern states of the United States, especially as regards temperature and rainfall—the important factors which influence the alteration of the rocks from which *kaolin* is produced. South China is more favored than the southern part of the United States in the wide distribution of the types of original rocks from which *kaolin* is derived and in the occurrence of large deposits of the clay.

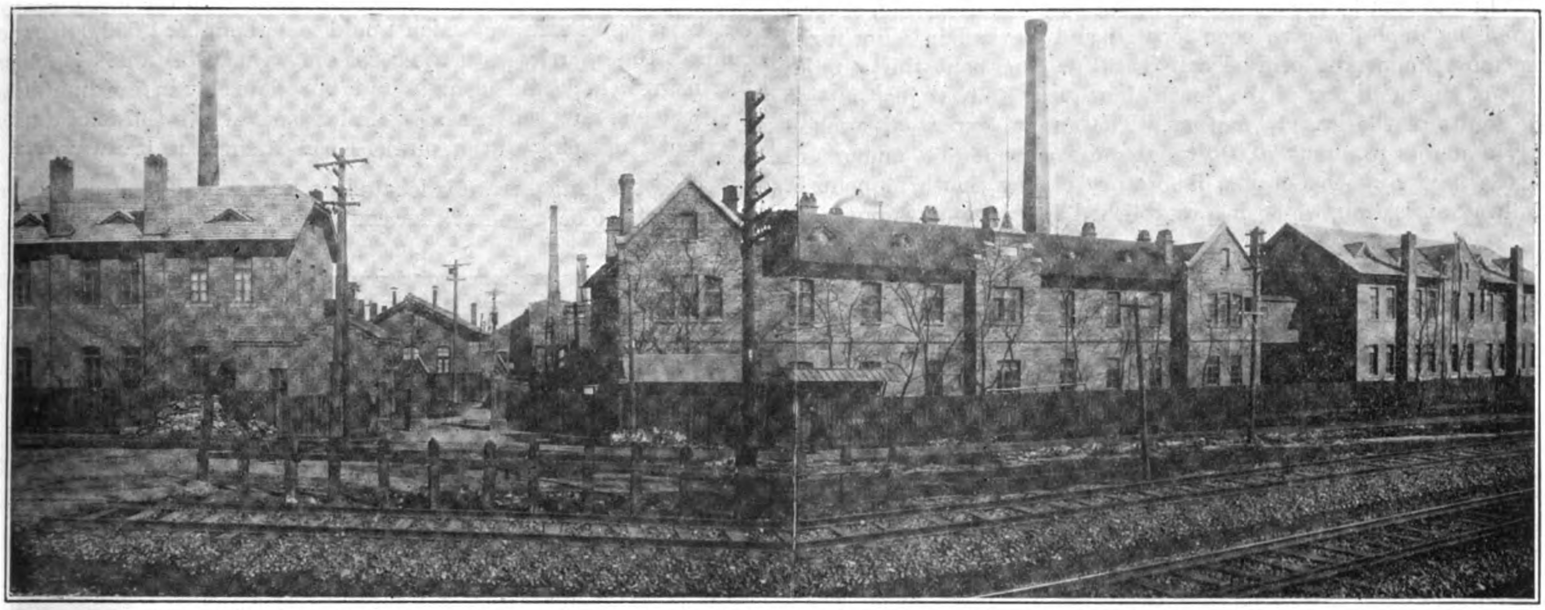


A Shop in "Porcelain Street"

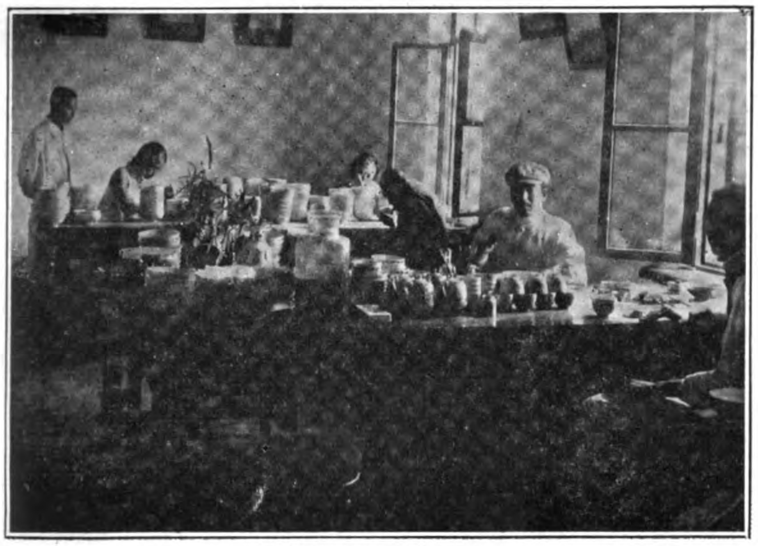
The high-grade porcelains are made from *kaolin* obtained within short distances of the pottery centres, but none of these *kaolin* deposits are conveniently situated for export. Transportation has not been in the past an important factor in the minds of the Chinese; the Chinese industries, especially the pottery industry, are the result of the gradual growth of centuries, starting with the object of supplying purely local needs. No consideration was paid in the first instance to factors other than the known occurrence of the raw material and the local market, the factor of transportation being negligible under these circumstances. Thus the output from the kilns at Te Hua is carried by porters in baskets, two balanced on a shoulder pole, distances ranging up to 100 miles to market.

In modern practice, the economic assemblage of raw materials for the product to be made and the case of reaching the best markets are thoroughly considered before the location of the manufacturing plant is decided upon.

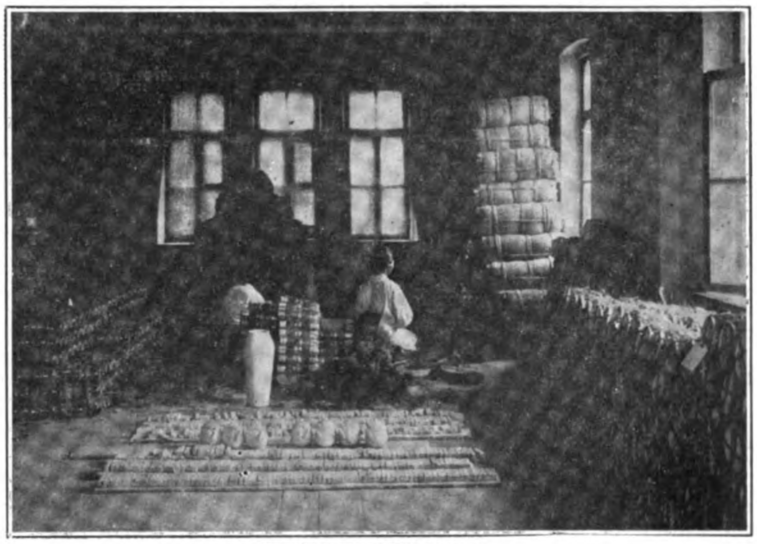
The most favorably located Chinese deposit of *kaolin* so far reported and which could serve as a source of supply for the foreign market, is in the province of Kwangtung, and as there is no pottery industry in this vicinity, the exploitation of the field should meet with hearty local co-operation, since it would offer continuous employment for a number of people otherwise dependent entirely upon the intermittent local agricultural demand for labor.



Ceramic Works at Dairen erected by the South Manchuria Railway Company and turned over to the Tahua Pottery Company

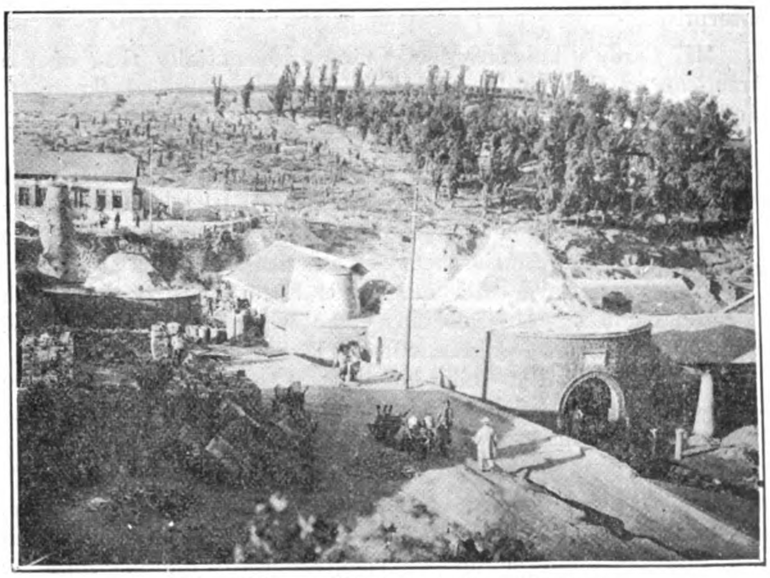


Decorating Bowls



Packing for Shipment

Chinese Potter at Work, Poshan

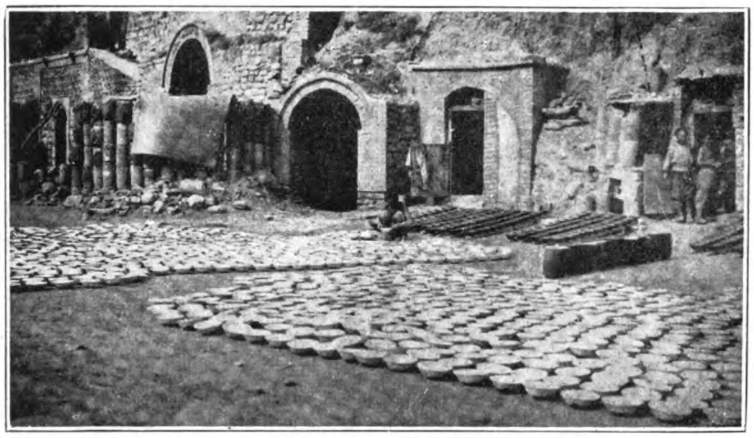


Chinese Pottery Works at Poshan, Shantung

Manchurian Deposits

In addition to the centres mentioned by Mr. Clements, several promising deposits have been located and worked in Manchuria, the most important being located at Fuchou about thirty miles west of the main line of the South Manchuria Railway just outside the limits of the leased territory. The annual export of Fuchou clay amounts to about 70,000 tons, and a considerable amount of this is used by the Ceramic laboratory of the South Manchuria Railway at Dairen, which has established a high reputation for its products and is now exporting china wares to Japan and elesewhere. A plan has been proposed to connect Fuchou with the main line by a narrow gauge railway, which would cost about Y. 1,000,000 or to connect the quarries with the coast only a mile distant. Another promising field producing high-grade porcelain clay in fair quantities and which is now being investigated is located two-thirds of a mile north of Tumenling station on the Kirin-Changchun Railway.

Another large centre is located at Poshan in Shantung where potteries have been at work for centuries.



Making Rice Bowls

Chinese Pottery Works

America's Best Opportunity

"IT is in China, not in Europe, or a possibly reorganized Russia that the greatest chances for American business lie. But at this moment conditions are distressing." Such is the opinion of a growing group of experienced Americans of whom the speaker quoted is among the most distinguished and the best informed.

W. F. Carey, famous in the Far East as a railway and canal builder, is an American pioneer of trade, and, more particularly, is an unobtrusive but widely recognized expert with regard to Chinese affairs.

Greatly to his surprise, Mr. Carey was recently elected president of the world-famous American organization known as the China society, the organization *par excellence* which links the great struggling republic, Americans, business and professional, who see the need of trade and friendship in the Far East generally, but especially in China, holding that there lie especially promising opportunities for the investment of American thought, money and enterprise.

Mr. Carey's knowledge of China is essentially that of the American of the constructive mind. He has studied the great land and people from the practical viewpoint.

' The very simple and impressive reason that to-day China offers the best opportunities for America and Americans to be found anywhere in the world," Mr. Carey went on, makes the presidency of the China society a big job for a man who realizes what the possibilities of co-operation between America and China are.

" The time never will come when Europe can offer us such splendid chances ; the time may come when Russia may, but it will not come soon. China's offering is now.

" Everything that China has is open to Americans, including those basic things which will give access to all others—transportations and communications.

" The people are there, the soil is there ; and it is fertile soil ; nothing is needed but the building of railways and for these the opportunities are so great that many thousands of miles might be constructed without running the slightest risk of building lines for which there would not be sufficient business.

If Americans do not build China's railways, making the vast profits they will yield, Europeans will.

W. F. CAREY

Famous as one of America's Foremost Railway Builders, and as head of the Siems-Carey Railway and Canal Company, holding contracts for the Construction of 1,100 miles of Chinese Railways and the Improvement of the Grand Canal, has been elected president of the distinguished American organization known as the China Society.

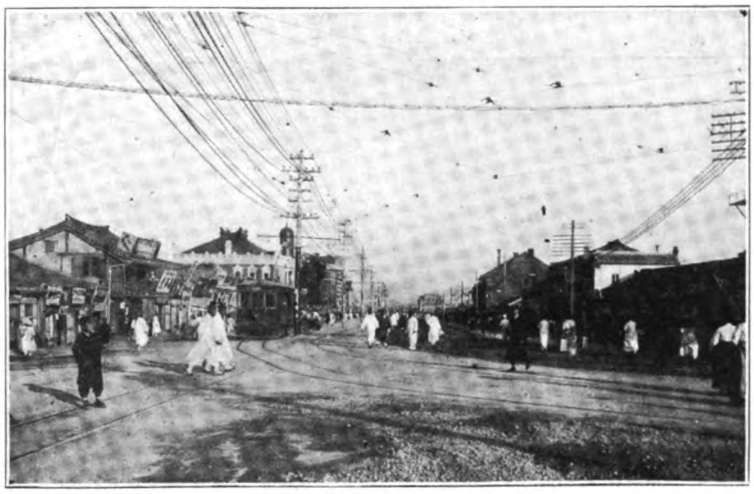
Engineering Notes from Korea

Electrical and Railway Developments

ABOUT forty towns in Korea are now equipped with electric light and power plants. With the growth of industry the number of applications for licenses to erect power houses has increased. Since the beginning of this year the following licenses have been granted :—

Name of company.	Purpose.	Promoter.	Capital.
Anshu Denki K.K. ..	Light	Utaka Yoshida	Y. 50,000
Keishu Denki K.K...	Light & Power	Saiichi Murakami	120,000
Yuki Denki K.K. ..	,, ,, ,,	Cho Otomo	200,000
Joshin Denki K.K. ..	,, ,, ,,	Sanei Kitagawa	100,000
Shari-in Denki K.K. .	,, ,, ,,	Taiko Denki	—

Besides these companies, it is known that the Keishun electric railway and the Kongosan electric railway will both shortly be opened to business. The electric bureau of the communications department of the Korean government will undertake to obtain loans at low interest for new electric enterprises in need of funds.

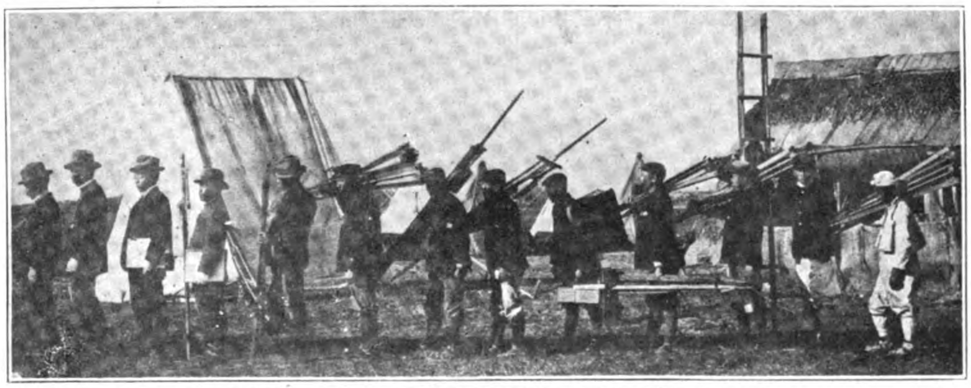

The Electric Tramway of Seoul

Railway Development

The survey of the new government railway line between Taicho and Shimpo has been completed and the bureau of communications will shortly invite public tenders for its construction. The total track between Taicho and Shimpo will be 32 miles. Between Kanko and Taicho, the Kankyo line, is now completed to a distance of 23 miles. When the line is completed 55 miles of track will be in operation.

Electrification of line postponed.

Keijo - Jinsen line not to be changed.


A Railway Survey Party Starting out in Korea

Much agitation has been going on about the electrification of the government railway line between Keijo and Jinsen. But the government is unable to see the advantage of the change as the number of passengers now carried is not sufficient to justify the expense of electrification.

However, the bureau of communications in the near future, will operate automotive railway cars on this line. The expense of these cars will be only Y.300,000, as electrification will cost Y.1,800,-000. The design of the cars has been adopted, and the Keikan workshop of the Chosen railways will construct the carriage bodies, while the machine parts will be made in Japan. These cars will be in operation this autumn.

The survey of the line of the Minami Chosen Tetsudo K.K., in the eastern, districts is making rapid progress. It is reported that the section through the Ryutan pass will be the most difficult to construct. Purchase of the right of way will be begun shortly, and construction in some parts will be inaugurated this month.

The Keinan Tetsudo K.K. has completed the first part of its program of construction. Stations on the line are almost completed and the erection of locomotives and carriages is finished.

The railway planned to run between Shingishu and Tashijima, called the Okorinko Railway, will be constructed by private capital. An investigation has been completed into the practicability of the line, and the application for a license will be made shortly. Estimating cost of construction Y. 100,000 a mile, the total cost for the 21 miles planned will be Y. 2,100,000. The company will, therefore, have to be capitalized at Y. 5,000,000 to Y. 7,000,000. If only one-fourth is paid up, as is usual, the authorized capital will probably be Y. 10,000,000 to Y. 15,000,000. As soon as the license to construct is granted, the capital will be forthcoming, as all arrangements with the people of the districts traversed have been made, and the line is very welcome.

There are eight private railway companies in Chosen today, which receive 8 per cent. subsidy on their paid-up capital from the government. However, only four of these companies have started operating and one of them even has done nothing at all since the license was granted. The total cost of constructing these eight lines will total Y. 70,000,000. The government will not increase its present subsidy of Y.2,500,000 a year, no matter what pressure is placed upon it and under these circumstances railway officials declare that it will be impossible to operate. Consequently, these four companies have not been pushing construction.

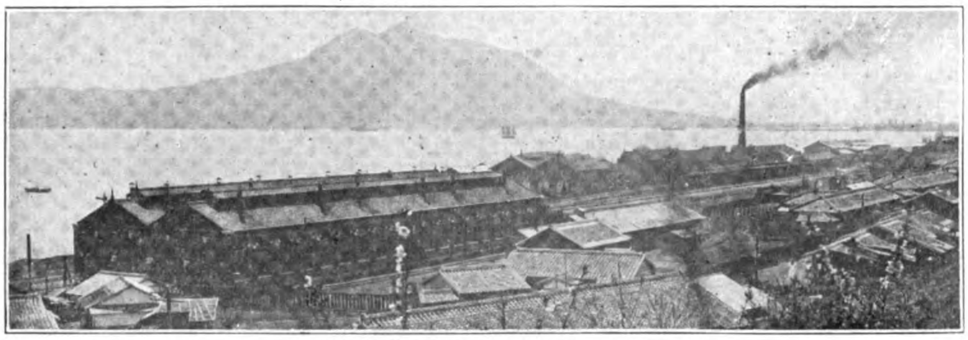
The Keinan Railway and the other seven companies have applied to the government for an increase of subsidy to 10 per cent. a year on the paid-up capital and also to extend the term of subsidy from ten to fifteen years.

Korean Railway Association

At the Chosen hotel in Keijo, on May 10, the first meeting of the Chosen railway association was held. The rules of the association were approved and the following officials elected : President : Yozo Kubo ; Advisors : Yasukichi Nishimur, Koraro Yuge, Shunkichi Minobe and Mitsutoyo Ariga ; Honorary Members : Rentaro Mizuno, Isaburo Yamagata, Ryutaro Nomura, Koi Furuichi, Gonpei Oya, Eiichi Shibusawa, Senkichiro Hayakawa, Eizo Ishizukz and R. Kanyo.

LOCOMOTIVES ON KOREAN RAILWAYS.—The Chosen railways (government) are operating 288 locomotives. Of this number 102 are used for passenger trains only, of which twelve are of the most

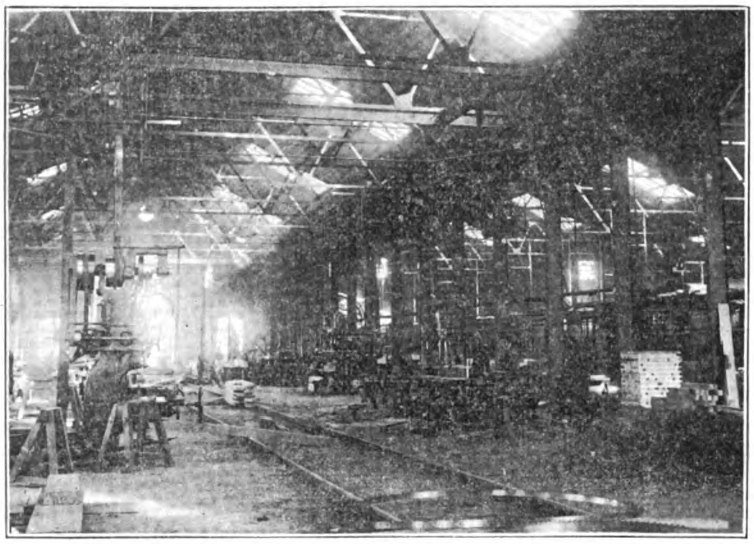
S.M.R. Workshops, Ryuzan, Korea

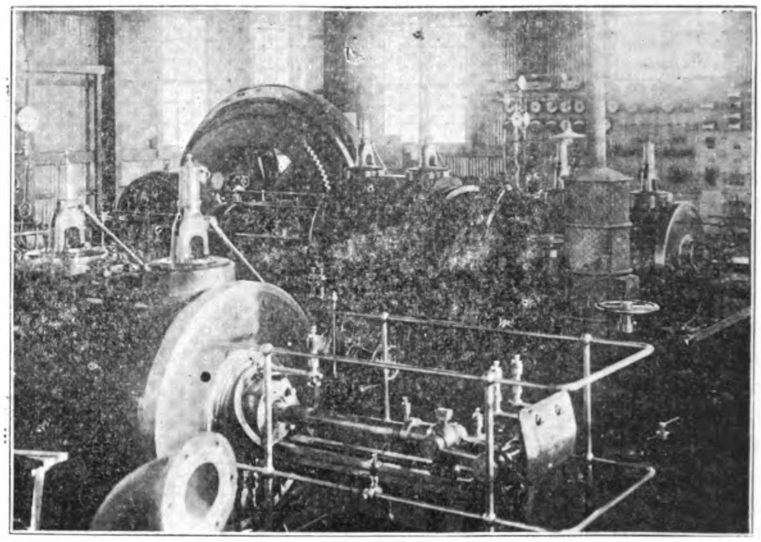

S.M.R. Workshops, Fusan, Korea

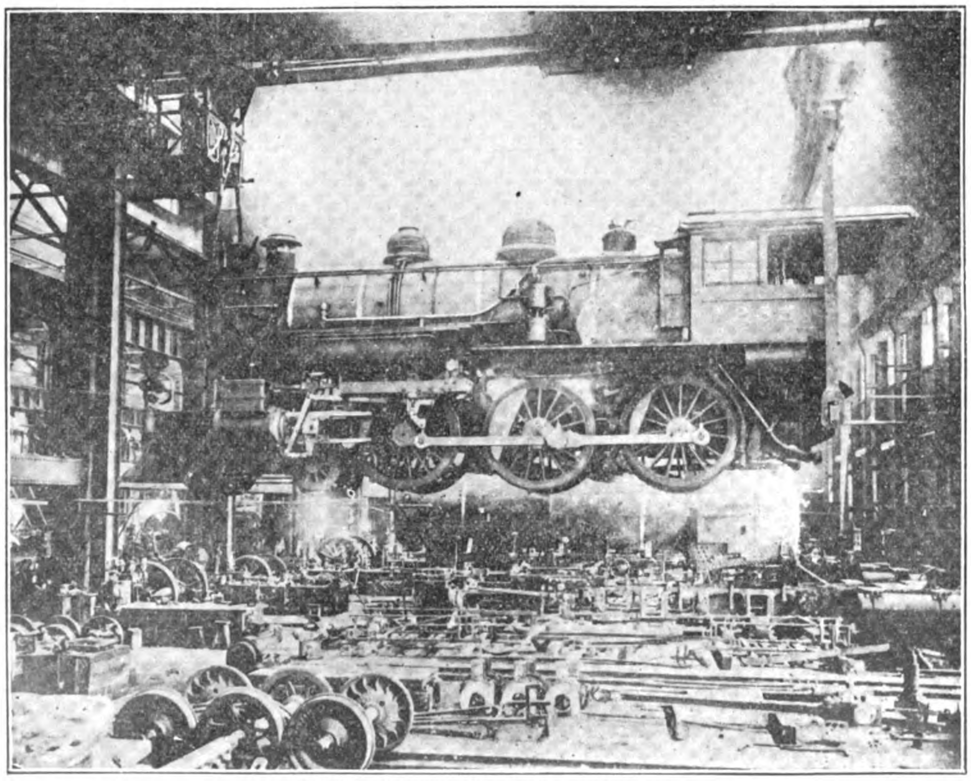
powerful "Pacific" type. Because of the inconvenience of using more than one locomotive on trains on the main line the railway bureau will purchase twelve more "Pacific" type locomotives during the present fiscal year, 1922-1923.

KOREAN MANUFACTURING STATISTICS, 1920.—The Chosen government general has just published the figures for industrial production in 1920. The total number of articles manufactured (including raw silk) was 190, valued at Y. 234,145,587. Articles produced by Japanese were worth Y. 70,865,295, or 36 per cent. of the total. Production by foreigners amounted to Y. 898,130, or 4 per cent., and the balance of Y. 159,693,162, or 70 per cent., was entirely produced by Koreans.

There are 34 joint stock companies (Kabushiki Kaisha), 7 Goshi Kaisha (Limited Partnerships), and 4 Gomei Kaisha (Unlimited Partnerships), engaged in agricultural production in Chosen. Their total capitalization amounts to Y. 33,009,000, of which Y. 20,980,100 is fully paid up.


S.M.R. Ryuzan Workshops, Boiler Shop


Engine Room


S.M.R. Ryuzan Workshops, Korea

All these companies capitalized at more than Y. 500,000 are given in the following table:—

Name	Address	Paid-up Capital *Yen*
Chosen Nogyo K.K.	Keijo	150,000
Koeki Shokusan K.K.	Seishu, Shusei Hokusho	1,000,000
Sannan Shokusan K.K.	Rinzan, Chusei Nando	280,000
Chosen Menka K.K. (Raw Cotton)	Mokuho	1,325,000
Fuji Kogyo K.K.	Keijo	2,200,000
Nakamura Gumi K.K.	Keijo	6,000,000
Nakashiba Sangyo K.K.	Kintei, Zenra Hokudo	500,000
Namboku Mengyo K.K.	Keijo	500,000
Namsen Kogyo K.K.	Koshu, Chusei Nando	125,000
Zannan Shokusan K.K.	Koshu, Zenra Nando	2,000,000
Chosen Nogyo K.K.	Karatsu, Chusei Nando	250,000
Fukudo Noji K.K.	Mokuho	500,000
Koryoku Nojo K.K.	Kanpei, Zenra Nando	300,000
Chosen Moji K.K.	Daido, Heian Nando	125,000
Shinmin Koshi	Keijo	125,000
Mizuhi Mojo K.K.	Teishu, Heian Hokushu	750,000
Ohashi Nojo K.K.	Ekizan, Zenra Hokudo	1,500,000
Kokai Sha K.K.	Keijo	262,500
Tomita Goshi K.K.	Chinnampo	500,000
Kunitake Nojo K.K.	Mokuho	650,000

Coal Resources of Karafuto

(JAPANESE SAGHALIEN)

THE principal industry of Karafuto in the past was fishing, at present it is wood pulp making; in the near future it will be coal mining.

The general development of industry in Karafuto has not been remarkable; at the end of 1920, the value of all products for the year was officially reported at only Y.45,841,299, the greater part of which represented pulp and marine products:

Pulp	Y.21,952,830
Marine products	10,720,691
Timber and Lumber	8,497,194
Metals and Minerals	3,360,034
Agricultural products	1,061,297
Dairy products	249,246
Total	Y.45,841,299

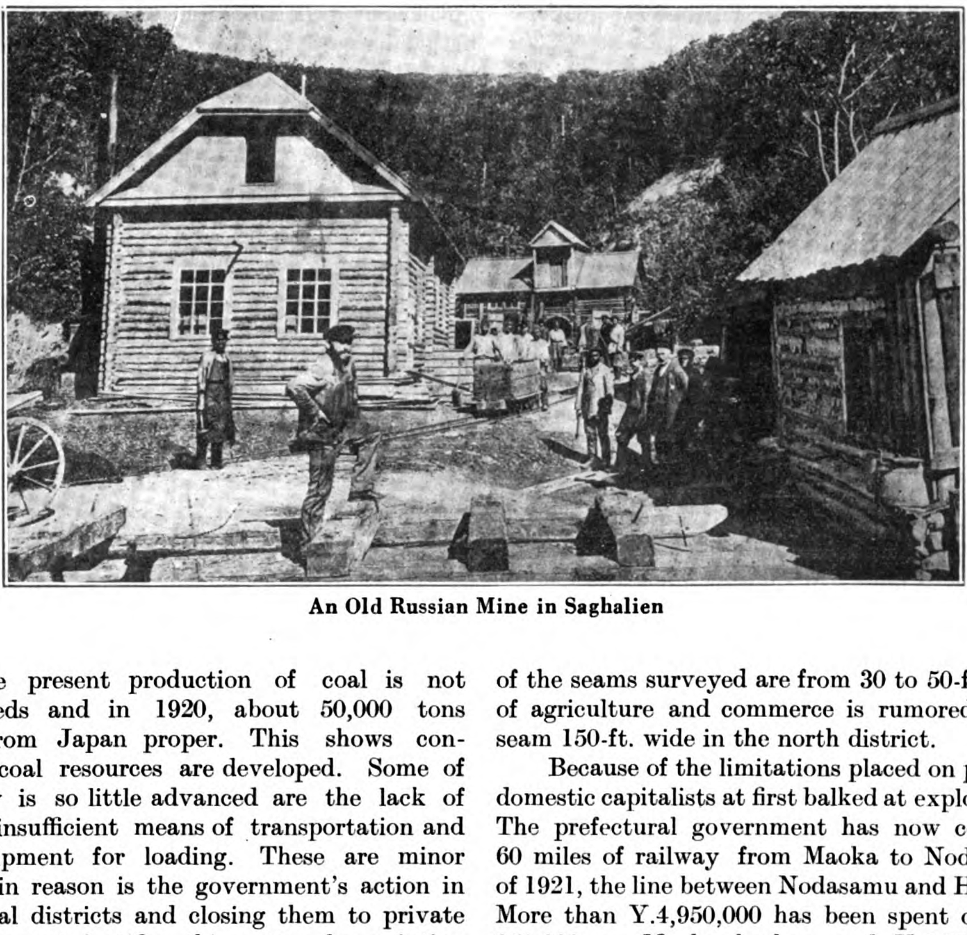
The mineral production was all coal.

From 1912, the production of coal in Karafuto has been increasing steadily:

1912, 415 tons; 1913, 83; 1914, 14,653; 1915, 27,626; 1916, 37,060; 1917, 57,830; 1918, 104,695; 1919, 135,427; 1920, 154,292.

At present, the only mines in operation are the Mitsui mine at Kawakami, in Toyohara Gun; the Karafuto Kogyo K.K. mine at Osakaye in Tomari Gun and also operated by this company on contract at Tomari in Tomari Gun; the Karafuto Tanko K.K. mine at Higashi Shiroura in Sakaehama Gun; and the Noboriko Tanko K.K. mine in Mototomari Gun. These mines produced in 1920: Kawakami, 1,114 tons; Noboriko, 39,964; Osakaye, 34,130; Tomari, 22,244; Higashi Shiroura Mines, 6,840; Total, 154,292 tons.

Besides these, there is also the Noda Samu Tanko K.K.'s mine which in 1917 produced 27 tons and 489 tons in 1918, but is now abandoned.



An Old Russian Mine in Saghalien

Despite the slow development of industry in Karafuto the present production of coal is not enough for the local needs and in 1920, about 50,000 tons had to be purchased from Japan proper. This shows conclusively how little the coal resources are developed. Some of the reasons the industry is so little advanced are the lack of railway communication, insufficient means of transportation and no effective harbor equipment for loading. These are minor reasons, however, the main reason is the government's action in nationalizing the main coal districts and closing them to private exploitation. The government justifies this action by pointing to the wasteful mining methods employed by small mine owners whose operations are usually speculative. The Karafuto coal deposits have always been considered too valuable to permit them to be exploited for individual profit and from the very first the government took the stand that they should be held as a reserve and for colonization development only. The intention has been to open the mine fields as industry developed and then only by the most modern mining methods.

The coal fields now closed to private exploitation include 500 sq. miles in the north, 150 sq. miles in the central and 500 sq. miles in the south, in all 1,150 sq. miles. In these districts there are many parts which have not yet even been surveyed. In the north only 85 sq. miles have been surveyed, in the central part, only 12½sq. miles and in the south 15 sq. miles, in all 112½ sq. miles.

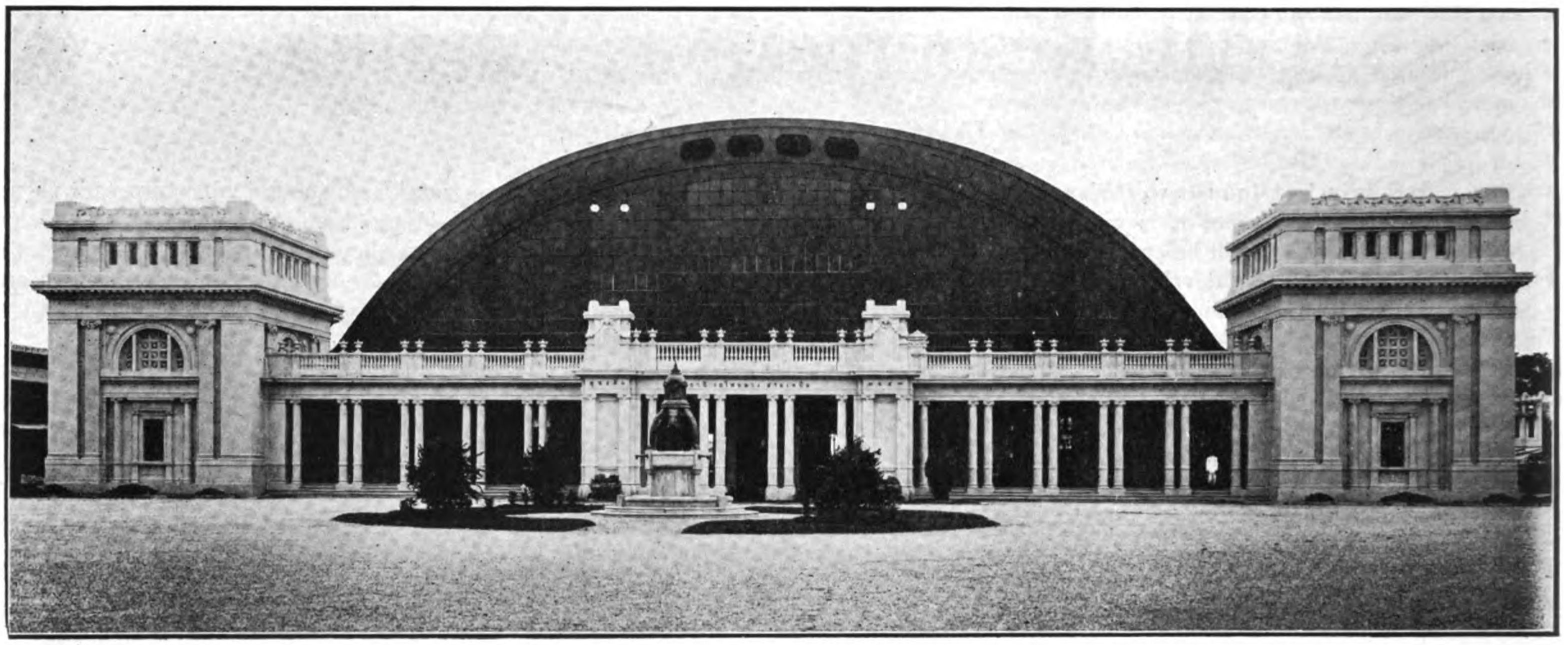
The Karafuto Kogyo's leased mine in Tomari is in the central part. This mine is government property. Despite the large area included in the government enclosure, there are still many very promising mine fields located on the outside. Coal mining in Japan has reached the limit of its development and Japanese coal miners are beginning to turn their attention to Karafuto in search of new fields to open.

Among those seeking for mining rights in Karafuto are the Mitsui Bussan K.K., the Furukawa Mining Co., the Mitsubishi Mining Co. and the Okura Co. At the end of December, 1921, these companies petitioned the government for licenses to mine in 1,112 different places outside the restricted areas.

Applications for licenses to mine, gold, silver, copper and to bore for petroleum amounted to 10 per cent. of this total. More than 1,000 applications were for coal. Most of these prospects are along the western coast of the Japanese territory.

Saghalien coal is particularly valuable in the manufacture of coke. Japan is lacking in good coke-making coal. According to reports there is an enormous quantity of this coal available. One company says that there are about 100,000,000 tons of coal in prospect in one sq. mile of their surveyed land. Some of the seams surveyed are from 30 to 50-ft. wide. The department of agriculture and commerce is rumored to have discovered one seam 150-ft. wide in the north district.

Because of the limitations placed on production by the climate, domestic capitalists at first balked at exploiting the Karafuto mines. The prefectural government has now completed construction of 60 miles of railway from Maoka to Nodasamu and from the end of 1921, the line between Nodasamu and Hisaharu has been doubled. More than Y.4,950,000 has been spent on Odomari harbor, Y.2,950,000 on Maoka harbor, and Y.2,500,000 on Honto harbor. These will be ice-free ports when construction is completed and thereafter export will be materially assisted.



Bangkok Terminus of the Royal State Railways of Siam

Siamese State Railways

THE 24th annual report of the Siamese State Railways for the year ending March 31st, 1921, shows a decrease in the gross receipts for the standard gauge lines of Tcs. 5,787,090, a decrease of Tcs. 544,263 or 8.60 per cent. under the former year, attributed to general trade depression. The working expenses were Tcs. 2,748,502 or 47.49 per cent. of the gross receipts. The net dividend after making due contribution to the renovation fund was 4.51 per cent. on the capital outlay of Tcs. 60,602,610, compared with 5.71 for the previous year. The total length of standard gauge line remains 950.5 kilometres.

The metre gauge lines (1,302 kilometres opened to traffic) have a capital account of Tcs. 64.453,190 or 50,871 per kilometre. The gross earnings were Tcs. 3,864,369 as compared with 3,926,589 the previous year, a drop of Tcs. 62,220 or 1.58 per cent. The working expenses were 2,259,916 an increase of 7.43 per cent. over the previous year, and 58.40 per cent. on the gross receipts. After deducting 322,266 for the renovation fund, the net profit was 1,215,187 or 1.58 per cent. on the capital.

Rolling Stock

During the year the remaining 18 locomotives out of the 25 ordered from the North British Locomotive Company were delivered and 17 placed on the southern lines and the remaining eight kept ready for the eastern and north-eastern lines. The total number of locomotives were 62 for the standard and 62 for the metre gauge lines. Eight first and second-class bogie passenger coaches, eight bogie vans and four bogie third-class carriages were received from the Metropolitan Carriage, Wagon and Finance Company during the year, while an order for six bogie restaurant and three bogie sleepers was placed with Cravens, Ltd., in October. 1920. The total number of carriages at the end of the year was 193 standard gauge and 119 metre gauge, or 312 for all lines.

The work of erecting and building bodies for the 200 underframes for the metre gauge goods wagons received during the year from the Metropolitan Carriage, Wagon and Finance Company, Ltd., was carried on. Other goods rolling stock was received from Baume et Marpent and the Midland Railway Carriage and Wagon Co., Ltd. The total number of goods wagons in service at the end fo the year was 891 standard gauge and 787 for the metre gauge.

Distributing channels take off from the main canal and the two branch canals, and from these again minor channels and water courses deliver the water on to the individual cultivator's fields. The main canal, the western branch canal and the system of distributing channels connected with these are nearing completion, and actual irrigation from them will commence for the rice crop of 2465 B.E.

The area to be protected annually by direct irrigation is estimated at 100,000 hectares, or 625,000 *rai*. Furthermore by linking up the new system with the old communication canals and creeks to the southward of Ghlong Hok Wah Sai Lang and utilizing the surplus water of the Menam Nakonayok, a copious flow of fresh water will be provided for the great and fertile, though low-lying plain, bounded by the Rangsit area on the north, the Menam Chao Phya on the east and the sea on the south. This water which will replace the noxious saline fluid, inimical to plant and animal life, that now stands in the canals and creeks of this area for a great part of each year, will supply irrigation of the kind known as indirect, or flood irrigation, consisting of the alternate flooding and draining of the land by one and the same set of channels according as desired. Thus in addition to the area directly affected, a very large tract will be indirectly benefitted by the system. It is to be noted that to obtain the best results in rice cultivation an efficient drainage system is practically as important as the supply of water.

The revised estimate for the Prasak project at present stands at Tcs. 13,300,000 and the expenditure up to March 31st 2463 is as follows :

2458 B. E. (1915-16)	.. ..	Ticals	388,402*
2459 B. E. (1916-17)	.. ..	,,	1,273,559
2460 B. E. (1917-18)	.. ..	,,	1,664,015
2461 B. E. (1918-19)	.. ..	,,	2,655,382
2462 B. E. (1919-20)	.. ..	,,	2,495,812
2463 B. E. (1920-21)	.. ..	,,	3,884,289
Total	..	Ticals	12,361,459

*Includes expenditure on other projects Tcl. 238,815.24.

Of the above sum Tcs. 2,000,000 has been expended on machinery, stores and plant which will be available for use on other projects if sanctioned.

At the present time the Siamese State Railways are composed of two different gauges, namely, standard gauge (4-ft. 8½-in.) on the east side of the Menam Chao Phya and metre gauge on the west side. Arrangements are being made to convert the entire system to metre gauge, and already a third rail has been laid on over 150 kilometres of the standard gauge lines, from Bangkok to Petriu and from Bangkok to Ban Phaji. The reasons for altering the gauge are paltry, in order to standardize the rolling stock, thereby effecting a considerable economy in spares and stores, and partly in order to render the entire system the same gauge as those of the Burma, French Indo-China and Federated Malay States Railways, with a view to making it possible at a future date to run through trains between all of the principal cities of South Eastern Asia.

The state railways were at one time to all intents and purposes organized as two separate railways. They remained so until July, 1917, when for a economic reasons the two railway system were amalgamated under the present commissioner general, H.R.H. Purachatra, the prince of Kambaeng Bejra.

The construction of the standard gauge state railways commenced in 1892 and the line from Bangkok to Ayudhya (71 kilometres) was opened in 1897. Since that time the line has been extended to Korat a distance of 264 kilometres. The northern line branches off from this line at Ban Phaji junction (kilometre 90) and from that point to Chiengmai the line is open to traffic, a total distance of 756 kilometres, from Bangkok, the last section from Pang Yang to Chiengmab having been opened to traffic on 1st January, 1922. A short line (69 kilometres) runs due west from Ban Dara junction, rotation on the northern line, to Sawankaloke. The eastern line running from Bangkok to Petriu (63 kilometres) was opened in 1908. The river line (6.5 kilometres) connects Makasan on the eastern line with the railway wharf on the Menam Chao Phya. The total length of all the standard gauge lines open to traffic is 1,025 kilometres.

In 1909 a second railway department was formed to build railways in the peninsula. This line known as the southern line is a continuation of the metre gauge line from Bangkok Noi to Petchaburi (150 kilometres), which was opened in 1903. From Petchaburi the line runs almost due south, passing through Prachuab Kirikan (Koh Lak), Bang Sapan, Chumpon, Lang Suan, Surashtra Dhani (Bandon) to Tung Song, where there are two branch lines, namely, the Nakon branch, and the port of Kantang branch. From Tung Song, the southern main line runs to Perlis boundary via Patalnug and Haadyai junction, joining up with the Federated Malay States Railways at Padang Besar, and the eastern branch of the southern main line, branching off at Haadyai and running through Mondhol Patani, joins up with the F.M.S. railways at Sungei Ghok on the Kelantan border. There is also a branch line to Singorol from Haadyai through Ootapao.

The through service between Bangkok and Penang was opened in July, 1918, three days being necessary for the trip, but since January 1st, 1922, arrangements have been made to operate a sleeping car service between the two points and reduce the running time to 36 hours. With the exception of some minor works the whole of southern line is now completed, the last section on the Patani branch from Balaw to Sungei Golok having been opened to traffic on 1st November, 1921.

The government has scheduled large extensions and many important works for completion during the next few years. Among the most important of these is the bridge over the Menam Chao Phya at Bangkok, which will join the two sections of the state railways after the gauge has been standardized into metre gauge. The administration will benefit by this measure considerably, being able to obtain an effective control for traffic purposes over the whole network of state railways, and to effect through running, not only over the whole Siamese system, but, by arrangement, through passenger and goods traffic into the neighboring states.

The proposed extensions comprise over 500 kilometres of new line, included in which are a line from Petriu to Aranya Pradesa a point within a few kilometres of the Cambodian border, and the north-eastern line from Korat to Ubol.

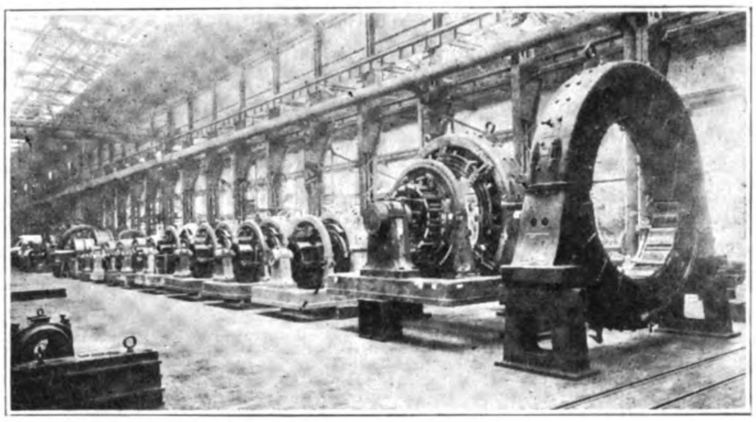
By far the most important event in the history of railway organization in Siam was the promulgation on 15th August, 1921, of a law on organization of railways and highways. The law establishes the department of state railways on a sound administrative and commercial basis, providing for the safety of the lives and property of the traveling public, facilitating consignment of goods, a fair and just method for the acquisition of land, and an effective control of private and industrial railways.

The measure of putting the roads and other highways in the provinces under the railway administration has been well adapted to the present peculiar needs in a country where roads as known in other countries do not exist outside the towns. Opportunity has now been given to devise and organize a comprehensive transport scheme, wherein roads will serve as feeders to the railways at important trading centres, and to augment the roadways and waterways where necessary, that is to say, where traffic justifies transport by road in addition to waterways and railways.

The private lines open to traffic amount to 106 kilometres.

English Electric Company

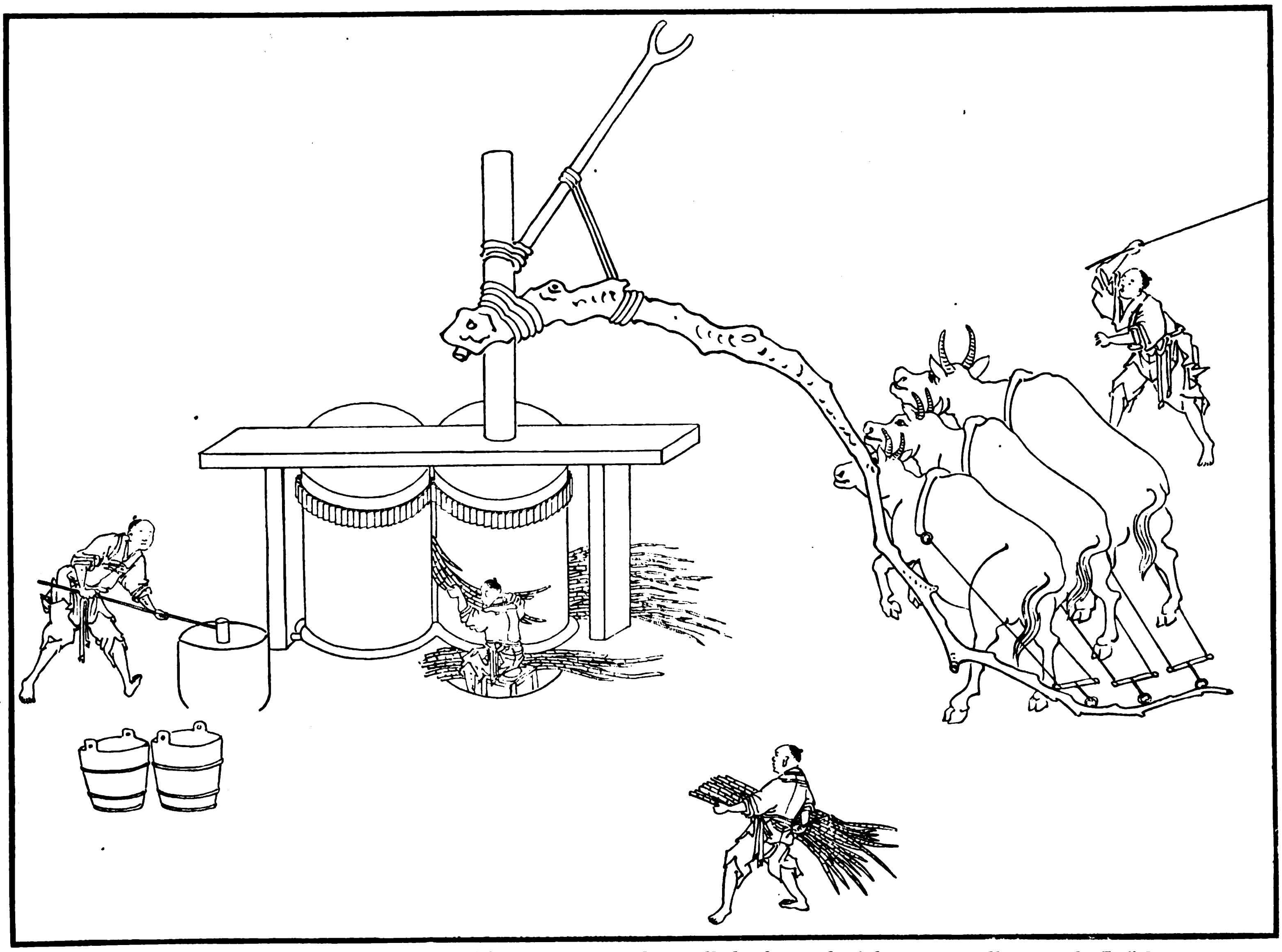
The illustration shows a number of rotary converters in various stages of construction. The frame on the right-hand side of the picture belongs to a very heavy current low voltage machine designed to give a direct current supply for rolling mill work. The armature belonging to it may be seen at the extreme left-hand side of the picture. This is designed to carry about 6,000 amps. and the special double-commutator construction can be clearly seen.



Next to the frame of this machine are a number of parts of 1,500 KW. machine for municipal service, designed to run at 42 R.P.M. and still proceeding to the left, we have machines of 1,100 KW., 1,000 KW., 500 KW. 250 KW., and 200 KW.

In addition to the above, four or five more machines were running on the test bed at the time, varying in output from 1,500 KW. down to 200 KW., and the modifications in design between the largest and the smallest sizes of some 15 machines dependent upon the conditions of service and the frequency of the alternating current supply form a most interesting and attractive study.

We understand that the English Electric Company intend to build all their rotary converters for industrial or municipal service at the Siemens Works, Stafford, which are exceptionally well laid out to deal with a wide range of machines, suitable for the varying conditions of periodicity and voltage met with in general municipal and industrial service. Another part of the same works is devoted to the manufacture of the whole of the A.C. and D.C. switchgear necessary to control the rotary converters, while the step-down transformers for working in conjunction with the converters are manufactured by the same company at their Coventry Works, so that the English Electric Company are in a position to furnish the entire equipment of a rotary converter sub-station from the products of their own factories.



Chinese Native Sugar Press; 450,000 tons of Sugar are extracted annually by thousands of these stone mills turned by Buffaloes

The Cane Sugar Industry of China

EDITORIAL FOREWORD. The project for the erection of a $5,000,000 sugar refinery in the vicinity of Shanghai invites attention to the state of an industry, which, like all things Chinese, rests its fame on past performances. With a domestic production estimated at 450,000 tons of open kettle sugars, and imports of 350,000 tons, the annual consumption may be placed at 800,000 tons, a per capital consumption of about four pounds annually, a market which any other government but that of China would make some serious attempt to preserve and develop for a home industry.

It seems to be taken for granted that lack of transportation facilities and imposition of *likin* make it impossible for China to ever become a factor in the world's sugar market. If we accept that the provinces of Szechuan, Hunan, Kiangsi and other interior districts are to become the future sugar producers of China, that statement would hold good, but we are of the opinion that any great development of the industry will take place in the provinces of Kwangtung, Kwangsi and the island of Hainan, in districts either on or adjacent to the sea coast, or within easy narrow gauge railway haulage. To our mind, the greatest obstacle to the operation of modern central factories arises from the fact that the land is split up into such small holdings (properties of families and clans handed down for generations) which are difficult to acquire to form an estate and just as difficult to count upon for a guaranteed supply of cane to justify the erection of a central factory. Without this guarantee of cane supply and enforceable laws that will indemnify the factory in the event of failure on the part of the planters to live up to contracts for the supply of cane, the development of the sugar industry along lines which have proved so successful in other countries, is almost impossible.

The likin barrier undoubtedly constitutes one of the greatest obstacles to the development of a home industry operating as it does as a discrimination against the Chinese themselves. Imports from foreign countries pay the five per cent. *ad valorem* duties and are shipped to the interior with a surcharge of 2½ per cent. tax, free of all further *likin* impositions. Chinese-made sugar on the other hand, is taxed at every *likin* barrier, which practically prohibits the export of sugar outside the producing province. Even this, however, would not operate immediately against the establishment of a modern mill, as each province could for some time consume its output.

Some years ago, the great British firm, Jardine, Matheson & Company, operating a sugar refinery at Hongkong, established a branch refinery at Swatow, the heart of the Hankiang cane sugar district, but the native officials and sugar dealers' guild brought pressure to bear upon the planters to restrain them from dealing direct with the foreigner. Unable to secure the necessary raw materials or of enforcing contracts for deliveries, even if entered into, the British firm was finally forced to give up the fight, close the refinery, dismantle the machinery and ship it to Hongkong.

The building and high chimney still stands dominating the port of Swatow, a permanent monument to Chinese obstructionist methods.

In 1913-14, at a time when it looked as though China would settle down under the firm rule of Yuan Shih-kai, the publisher of this magazine endeavored to put some life into the cane sugar industry of South China, and in order to interest foreign capital in erecting central mills, prevailed upon the Chinese government to grant a subsidy to the extent of guaranteeing eight percent on the capital actually invested in such enterprises. The government was also prepared to strengthen the weak point in the central factory system by providing the necessary guarantees that a stipulated amount of cane would be delivered at the mills under an equitable contract between the mill owner and the farmers. In this respect, the old Chinese officials at Peking deserve considerable commendation. They went as far as they could to induce foreign capital to come and have a " look see " at the industry and install an experimental plant somewhere in South China. Financial conditions in the United States and the instability of China's internal affairs however decided those interested in new sugar enterprises to reject the proposition. The war precluded any hope of resurrecting the scheme.

From the following memorandum submitted by the ministry of agriculture and commerce to the president some time during the month of November, 1914, it will be seen that the Chinese authorities made a careful study of conditions surrounding the creation of a modern sugar industry in China and practically adopted the main features of the system which proved so successful in developing the industry in Formosa:—

" Through want of improvement the sugar industry of this country has been declining all the time, and as shown in the customs return, the import of foreign sugar has increased tremendously, while the export of Chinese sugar has dwindled to nothing. Owing to the European war the colonies of foreign powers where sugar is produced have been affected, and it is certain that in the coming year the world will be in need of sugar. Hence it offers a most important opportunity for the Chinese to improve the manufacture of sugar so as to supply the needs of the world. The Ministry after considerable discussion desires to offer two suggestions for the improvement of the sugar industry, namely, (1) to fix districts, and (2) to institute investigations.

" The cultivation of sugar canes and the manufacture of sugar must depend upon each other. They must be in proportion, and if there are too many sugar factories in one place there will not be sufficient sugar canes for them to manufacture sugar. Therefore when applications are made for the establishment of sugar factories the districts will be fixed according to the capital of the factory. Again with a certain district all sugar canes produced there should be sold to a particular factory, thus it will prevent the raising of prices.

" In almost all foreign countries, the manufacture of sugar is strictly inspected by the authorities, but there is no such thing in China. The sugar merchants of this country have always put some mixture in either red or white sugar so as to make more money without giving any consideration of the injury they have done to their trade. Consequently the people of this country prefer to use foreign sugar though it is more expensive.

With the above corrupt state of things, there will be no success though the government has promulgated a set of regulations encourageing sugar plainting and guaranteeing the interest for the capital of the company. This ministry has made the following proposals : (1) When any person wants to manufacture sugar, he must send an application to the ministry of agriculture and commerce, requesting that the sugar canes produced in a certain district be sold to him for the manufacture, and the material for the manufacture shall be sugar canes or sweet vegetables. (2) After the district has been assigned to any person, no other factories shall be established there. (3) All the sugar manufactured should be subjected to the inspection of the authorities. (4) Those factories which have been established before the promulgation of the present system shall register themselves in the ministry within the 4th year of Min Kuo. If the above plan be carried into effect, the sugar industry will soon be developed.

The President's Reply : The above petition is hereby approved, and the ministry concerned is ordered to put it into effect.

In January of the following year, President Yuan issued a mandate promising that the government would lend to any sugar factory a sum of money equivalent to five percent of its paid up capital, hoping thereby to encourage the formation of native sugar companies. In March of the same year, the minister of agriculture telegraphed to the governors of the southern provinces the offer of the government and urging wealthy people to invest in modern sugar mills in order to supply the home demand. This also failed to produce results. China let a golden chance slip by during the war, and it is hardly probable for some years to come that the central government will be in any position to follow up its sugar development program of 1914, and if guarantees of interest on invested capital is essential to the development of the industry, these subsidies and other aids must emanate from the provincial governments.

The success of a modern cane sugar industry in China will depend largely upon the selection of proper districts, the importation of new seed cane and the erection of suitable mills, under laws that will guarantee the latter from competition and assure to them that the farmers will live up to their contracts to supply the cane. We are of the opinion that it would be extremely difficult to find a district where a 500 ton mill or over could be erected with reasonable prospects of success, and our judgment would be that the Chinese would have to be educated little by little to the use of modern machinery by starting in at the bottom with a cheap and efficient steam mill giving a maximum extraction operating with open trains, and then gradually expanding these mills, by the introduction of evaporating apparatus, centrifugals, etc. Once the Chinese can be shown that the saving in extraction alone will pay for a steam mill in one crop or two, and the foreigner is willing to extend long term credits, an opening can be made. The future of the cane sugar industry therefore depends largely upon education.

We also incline to the belief that the best results would be found somewhere in Kwangsi or on the island of Hainan, for although the Swatow district and other parts of Kwangtung are already devoted to cane cultivation, whenever the pressure of the staple food supply is great, that is, when the price of rice increases, the tendency is to increase the rice acreage.

This tendency is witnessed in Formosa where the industry is under strict government supervision. The same is true in other parts of the Far East. For this reason, we believe that the unsettled districts of Kwangsi province and the island of Hainan offer the most favorable opportunities for the establishmnet of a modern cane sugar industry in China. Because of their geographical situation within the tropics, climatic and soil conditions in these sections would assure a higher sugar content in the cane than would be possible in the Upper Yangtze regions or Fukien. The island of Hainan, situated outside the zone of political disturbances having an area almost as great as that of Formosa and abundance of cheap labor, seems ideally located for the establishment of the industry. A little initiative with ordinary risks coupled with sufficient government protection and, if necessary, subsidies, and the proper selection of a district in close promiximity to deep water, seem all that is needed to build up a profitable home cane sugar industry in China.

Notwithstanding the proverbial business honesty of the Chinese, this trait cannot be said to extend to their preparation of certain commodities for the market. The adulteration of tea lost for them the great tea trade of the world and handed it over to more honest merchants. Similar adulterations of native sugar has driven even the Chinese consumer to purchase the foreign article, and any attempt to build up a modern sugar industry, would have to be done under strict government supervision, especially if an official subsidy, guarantee, or aid of any kind is extended.

Furthermore, we are also of the opinion, that the time is past when the Chinese will consent to foreign capital controlling an industry of such magnitude as the sugar. A couple of years ago, there was much talk of Chinese-American and other foreign cooperation, but as far as we have been able to gather, this talk was all one-sided, emanating from the foreigners and not from the Chinese. Experience has proven that cooperation with the Chinese when it comes down to brass tacks, takes the form of Chinese control of the enterprise, in which they are willing to utilize up to 49 per cent. of foreign capital with foreign technical supervision, pending such time as their own experts can be educated.

In applying this condition to a solution of the cane sugar industry, the best that the foreigner can hope for is a participation in the capital and the profits from selling and installing the machinery, with perhaps a participation in the profits in return for technical supervision. Or, the precedent created in the Philippines might be followed in a modified way, in which the government would contract with a foreign concern for the erection of the plant and its

supervision, and at the expiration of a number of years, the plant would revert to an association of native planters who supply the cane. G. B. R.

* * *

Notes on Cane Sugar in China

The exact date when sugar cane was introduced into China is not known, but from the " Botanical Classification " compiled during the Ming era, and other standard Chinese works, the manufacture of sugar seems to have been introduced amongst the Chinese for the first time during the reign of Emperor Tai Tsung in the Tang dynasty, in the early part of the seventh century. So it may be accepted that the history of sugar in China goes back over a thousand years, and from the state of the industry at the present time it is apparent that it has not progressed one step since it was first started. The methods handed down from their ancestors have been preserved in all their crudeness with the result that the once flourishing industry gradually declined until the greater part of the consumption is now supplied by foreign, and especially Java refined sugar.

Primitive Methods

The methods employed in extracting sugar from the cane are primitive in the extreme. The following description of the process will cover the entire field in China :—

During the harvesting of the sugar cane a number of small rough sheds are erected for the manufacture of the sugar. Outside each shed there is a set of presses, driven by two oxen or buffaloes. Inside are three or four large iron pans, placed over a shallow ditch, which constitute the boilers.

The mill consists of two granite rollers, fixed perpendicularly to a wooden frame. These wheels are turned by a long lever, one end of which is fixed to the upper axle of one of the wheels, and the other connected with the yokes of buffaloes. The animals are driven round in a circle, and small bundles of sugar cane fed between the revolving rollers. The juice flows into a large earthenware receptacle beneath the wooden frame. Any person with ordinary intelligence can work the pressing apparatus, and it is generally managed by the farmer and his family, but a little skill is necessary for boiling the juice, and this is usually done by an expert.

After the juice, previously mixed with a little lime and tung oil (wood oil), is boiled to the required consistency, it is removed from the boilers by a large ladle and put in shallow bamboo pans, where it is left to criptalyze into brown sugar bricks. When the sugar season is over, the sheds are pulled down and all the apparatus removed except the stone rollers. The sheds are erected and fitted up annually.

The places noted for the production are largely in the south where the climate is warm, although a considerable industry is located in Szechuan. The provinces of Kwangtung and Fukien produce about half the estimated production, the greatest producing areas being located in the Hankiang, Lukiang and Kinshi valleys. In olden times, the Canton delta was extensively cultivated to sugar cane, but the ground is now given over largely to orchards and the mulberry tree.

The Hankiang Valley

The Chaochow district of Kwangtung, or the region back of Swatow heads the list in regard to the production of sugar with an area planted to cane estimated at nearly 20,000 acres. The seed is planted early in the spring and harvested in ten or eleven months. It is said that at least three ratoon crops are obtained from the original planting in this district. Bean cake is largely used as a fertilizer and the number of small mills in operation is said to be over 2,000 producing over 1,000,000 piculs a year, or a yield of over three tons to the acre.

The industry in this district reached its high water mark in 1899, after which a steady decline in production and exports set in due to the gradual displacement of the native sugars by imports from Java, Hongkong and Japan. The once great industry of this district met the same fate that befell China's tea trade. Adulteration, poor quality and refusal to install modern machinery lost the home market to sugars from other countries. The taste for the cleaner and cheaper article throughout China was being generally acquired, which was not offset, as was hoped by being used as an ingredient in dyeing silk piece goods. Orange orchards begin to take the place of the cane fields and the industry seemed to be on its last legs when a new demand was created as a result of the war. This however has fallen off and the industry is again at a low ebb.

There are two varieties of cane produced in the district, one reddish in color, 5 to 7 feet tall, and over 1 inch in diameter ; the other called the white cane, which is 6 to 8 feet high and 1 inch in diameter. The former in its natural state is popular with the natives, who chew it because of the excellent flavor of the juice ; the latter is used for crushing to obtain the sugar that is marketed.

Fukien Regions

In the Lukiang and Kinshi valleys the cultivation of cane is carried on extensively near Chuanchow and Changchow. Here the annual output, estimated at 300,000 piculs finds its market through the port of Amoy.

The prevailing climatic conditions in the district makes it well suited for the production of sugar cane.

But the local production does not begin to meet its requirements in sugar consumption. In fact, sugar is one of the larger items of import into Amoy ; the imports of brown, white, and refined sugar during the year from 1914 to 1919 being :

Year.	Brown sugar.		White sugar.		Refined sugar.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1914 ..	363	$16,358	6,888	$418,720	1,161	$ 73,037
1915 ..	442	21,445	1,201	91,419	4,140	356,142
1916 ..	66	4,337	3,537	299,874	3,081	339,960
1917 ..	64	4,578	2,027	191,654	1,465	189,660
1918 ..	115	9,257	4,612	550,954	4,197	608,949
1919 ..	246	34,709	2,524	448,628	2,415	536,407

The sources of many of these imports are Singapore and Samarang, while most of the refined sugar reaches Amoy from Hongkong. Amoy is the only port of entry into the district.

The district has a small sugar-candy industry, but here again the imports far exceed the exports. Exports go principally to overseas Chinese in the Philippines, Formosa, the Straits Settlements, and the Dutch East Indies. Imports are mainly of British and Chinese (Shanghai) manufacture.

Accurate statistics regarding the area in the district planted in sugar cane are totally lacking. According to a consular report a fair valuation of the crop would perhaps be about $500,000, or about one-third of the value of the district's annual consumption in sugar. The section in which the most cane is grown is around Siokhe, Pholam, and Ticthoa, all in the Changchow prefecture.

It was thought at one time that a profitable sugar industry could be established in the Amoy district. Several mills with more or less modern equipment were started in Changchow and at other points in the cane-raising region. *But the high hopes entertained were not realized, for the reason that the growers failed to supply the mills with sufficient quantities of cane to operate on a paying basis.* The mills were forced to close down, and to the present time have not been reopened.

Canton Delta

This region was famous for sugar production in former years but the industry is now confined to Tungkwan and Waichow where brown, white and candy sugar is made. The annual production is said to reach as high as 400,000 piculs, but this is perhaps an over-estimate. The output is exported through Canton, Kowloon and other ports. Cane is also grown and crude sugar made and exported from the island of Hainan, the province of Kwangsi and Chekiang. In fact, in nearly every place in south China sugar cane is cultivated in small patches.

Kiangsi Province

Tangkiang in the Kanchow district of south Kiangsi is also a sugar centre of some importance. Here the practice is for a few hongs who engage in its manufacture to contract with the farmers a few months ahead for the supply of cane which is paid for on a fixed percentage of the sugar extracted and at a fixed price. This would seem to be the central factory system in a crude form, and might serve as the starting point at some future date for a modern central factory contracting for its supply of cane in the district.

Szechuan Province

Out of a total estimated production of 400,000 tons of sugar, for the whole country the province of Szechuan produces one third, or 133,000 tons.

Large quantities of sugar cane are grown in West China, one variety of which—reddish-purple in color and 5 to 8 feet in height, with a diameter of 1 to 1½ inches—is sold in its natural state for chewing, being succulent and of excellent flavor. The crop is harvested in November, but the canes are buried in such a way that they keep for many months and are taken up and sold according to the market demand.

The cane from which sugar is made is known as white cane and is considerably taller, though of smaller diameter, than the red variety. It is very rich in sugar content and is a most important crop in the Neichiang and Tzechow districts. This cane also ripens in November, but is frequently seen in the fields as late as February.

A few years ago influential Chinese interested in the sugar industry desired to improve the methods of cultivation and to obtain sugar-cane seeds or cuttings from the United States or the East Indies, so that a better quality of cane could be produced.

The promoters of the scheme collected $158,000 United States currency, and compromised to raise $236,000 more if necessary to erect a factory to produce 30 tons a day. Enough cane is grown to keep such a mill in operation. Altogether there are about 48 sugar districts in Szechuan, the most important of which are Chienyang, Tzeyang, Tzechow, and Neichiang. Chienyang and Tzeyang alone are said to produce about 40,000,000 pounds of sugar a year, and it is estimated that five times this quantity is produced in Tzechow and Neichiang. Sugar cane in these districts is cultivated, for the most part, along the river banks, greatly facilitating transportation.

Refineries in China

It is difficult to obtain detailed information about the equipment and outputs of the two Hongkong refineries. The Taikoo Refinery owned by Butterfield & Swire is operated as a private enterprise and no reports are published. The China Sugar Refining Co. Ltd., of which Jardine, Matheson & Co. are the general agents, however, is a registered Hongkong Company capitalized at $2,000,-000 (silver) divided into 20,000 shares of $100 each fully paid up. The gross profit for the year ending December 31, 1920, including credit balance of $33.806 from the preceeding year was $2.996,741. The company paid an interim dividend of $15 per share on August 21, 1920 ($300.000) and a final dividend of $65 per share ($1,300,-000) a total of 80 per cent for 1920, carrying forward to the 1921 account $75.781. The Company's assests in land, buildings and machinery, which embrace the East Point Refinery at Hongkong, the Hongkong Distillery and the Swatow property are valued at $1,149,990. The distribution of the profits for the year ($2.996,-741 is evidence of the sound and conservative financial policy pursued by this enterprise. This was apportioned as follows: Sugar fluctuation account, 700,000; equalization of dividend fund, 300,000; Employees' provident fund, 100,000; building reserve, 140,000; write off patent rights 50,000; bonus to staff, 30,960; dividends, 1,600,000; carried forward, 75,781.

These figures may also give some indication of the prosperity enjoyed by the larger but private enterprise of the Taikoo Refinery. This magnificent showing made by the Hongkong refineries undoubtedly influenced the Chinese in Shanghai to have a refinery of their own located outside the settlement in territory under Chinese jurisdiction. The company, like all new enterprises in China, is being launched as a patriotic venture in order to create the proper atmosphere for the sale of shares. The promoter, Mr. M. Y. San, is the head of the largest and most successful confectionery business in China, whose products are gradually displacing imported biscuits and candies for native consumption. The prospectus of the new Chinese National Sugar Refining Company, Ltd. calls for a capital of $5,000,000 (mexican) divided into $50 shares, of which one quarter is to be paid in immediately. There are forty organizers of the new enterprise, including such well known names as Chang Chien, C. C. Nieh, C. T. Wang, Li Ching-fang, Chang An-sun and others. Four-fifths of the capital has been allotted to the organizers, and the other fifth placed on the market. The prospectus states that the profits of the enterprise will be divided as follows: 55 per cent. to the shareholders; 10 per cent. as a special bonus for the organizers; 10 per cent. to pensions and reserve funds; and 25 per cent. as bonus for directors, auditors, general manager, staff, etc. The bonus appropriation of prospective dividends would seem to be liberal enough to cover all necessary calls upon the company from official sources, and indicates that the enterprise is expected to be extremely profitable.

Malayan Match Factory

With the ultimate objective of supplying the entire market of the Malay peninsula, Malayan Matches, Ltd., a concern capitalised at $1,000,000 (Straits currency) and registered in the F.M.S., commenced operations in the latter part of June.

The machinery, of German manufacture, was taken over from a defunct firm which had tried to operate in India. A company was formed to set up the plant in Malaya some three years ago, but an unexpected delay was encountered when the F.M.S. government refused to allow the company's engineer to enter the states, under the ruling barring Germans and Austrians. The Teutonic match expert was sent to Java there to await the efforts of the company to have him admitted. He finally severed connections with the firm, and an Englishman, Mr. D. J. Simons, was commissioned to install the plant, Mr. Simons is at present being retained as engineer in charge.

A labor force of 85 including Malays, Chinese and Tamils, mostly women and boys, are employed in the new match factory. The product, which is already on the market, is as yet a bit crude, but the labor has not yet been completely trained. Until the finished matches are considered of sufficiently high grade, the plant will not be run at capacity speed. When operating at normal, the output will be form 850 to 1,000 gross boxes per day, which is equal to the consumption of Malaya. While no effort will be made to invade outside territories, Company officials expect to displace a good portion of Japanese imported matches on the F.M.S. market, as the Malayan product is selling for $1.30 per gross, which is lower than the Japanese figure.

The plant is situated about 30 miles from Kuala Lumpur, F.M.S., near the Malayan collieries, and on the edge of a 16,000-acre forest reserve from which the material is drawn.

Messrs. J. A. Russel & Co., Ltd., Kuala Lumpur, are managers and agents for the new concern.

Navigational Instruments

THE navigator of the present day certainly owes a great deal of gratitude to the scientist for the developments made in connection with the navigational equipments fitted to modern ships.

In this work the late Lord Kelvin took a very prominent part. His inventions and additions in connection with the mariners' compass, sounding machines, etc., have been of the highest importance. Were it not for these scientific advancements, the safe navigation of the fast and up-to-date liner would be a matter of the greatest difficulty. Great attention is naturally given to the equipment of every new liner with the most improved and up-to-date compasses.

Messrs. Kelvin, Bottomley & Baird, Ltd., Glasgow, London and Newcastle, are the sole makers of the late Lord Kelvin's inventions, and have fitted the largest liners with their well-known compasses and sounding machines. The most recent vessels to be equipped with these instruments include: *Aquitania, Cameronia, Windsor Castle, Empress of Canada, Paris, Conte Rosso.*

"KELVITE"
Standard Compass

The standard compass on all these vessels is Lord Kelvin's patent, as illustrated. This compass is so well known that it is not necessary to describe it in detail.

Messrs. Kelvin, Bottomley & Baird, Ltd., a few years ago introduced a new scientific steering compass to the navigator, specially designed for positions where considerable vibration occurs.

"KELVITE"
Vertical Card Compass

This compass is known as the Kelvite Vertical Card Compass, the salient features of which are—

(*a*) A liquid bowl containing card of relatively small diameter, which ensures extreme steadiness and sensitiveness of the card.

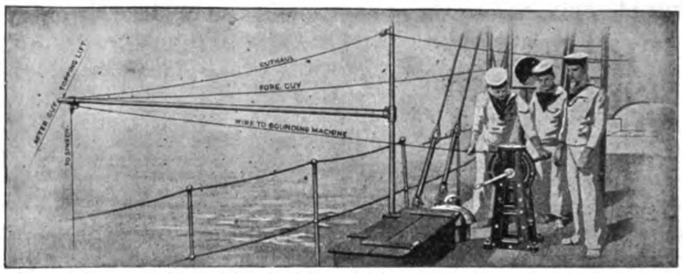
(*b*) A greatly magnified image in a vertical plane of the part of the card which is in the vicinity of the lubber point is of considerable advantage. The complete card may also be viewed by the steersman through the usual sight in the helmet. This compass is designed to allow the card to be illuminated from above or below.

Another improved appliance supplied by Messrs. Kelvin, Bottomley & Baird, Ltd., to the *Aquitania* and other vessels is the latest form of Lord Kelvin motor-driven sounding machine. This instrument possesses distinct advantages over any other similar appliance, amongst others are that soundings can be taken from the navigating bridge instead of from aft, and that the navigator is able to read conveniently the depth of each cast for himself instead of being dependent upon a message conveyed from aft.

Large view magnified vertical image

The dial showing the amount of wire line run out is fixed on the top of the machine, so that, if the machine is fixed below the bridge, the dial can be read conveniently from above. The dial indicates accurately the exact length of wire out, and the figures are bold and clear to facilitate reading. While the depth may be ascertained in the usual way by means of the depth recorder or the chemical tubes, it is intended that with this machine the depth may be readily ascertained from the length of wire out. Tables are prepared showing the depth indicated for each fathom of wire run out with the vessel traveling at all varying speeds, consequently, when taking a sounding and the vessel's rate of speed at that moment being known, the corresponding depth for any length of wire can be instantly ascertained, the moment the lead touches bottom, by inspection of the tables.

"KELVITE"
Motor Driven Sounding Machine



Soundings being taken from Amidships

Messrs. Kelvin, Bottomley & Baird, Ltd., issue a quantity of interesting literature dealing with their unique manufactures, which can be obtained on application at their head office, 18 Cambridge Street, Glasgow.

*Messrs. Kelvin, Bottomley & Baird, Ltd., have introduced the term "Kelvite" which they apply to all their manufactures whether they be Lord Kelvin standard compass, sounding machine or otherwise. Messrs. Kelvin, Bottomley & Baird, Ltd., advise that the word "Kelvite" means manufactured by them and that would-be purchasers who desire the genuine articles should specify them with the prefix "Kelvite," thus: "Kelvite" Standard Compass; "Kelvite" motor-driven sounding machine, etc.

REVIEW

A book entitled "Universities and Scientific Life in the United States," has recently appeared from the Harvard Uuiversity Press, Cambridge, Mass., U.S.A. The author is Professor Maurice Caullery of the Sorbonne, exchange professor from France to Harvard University, during the war. Prof. Caullery is a biologist, and a man of keen observation not only in his own field, but in general affairs as well. He has presented the development, present status, problems and ideals of American university education from a fresh viewpoint, all too little heard from—the standpoint of the scientific man. His criticism of both American and European ideals will help educators in China in preserving a sane balance of thought on educational programs. Also the book will be useful to Chinese students as a guide to American universities, more helpful from being the work of a foreign observer.

The translation is by Prof. James Haughton Woods of the Harvard department of philosophy, and Prof. Emmet Russell of Nankai College, Tientsin.

The New Diamond Valve-in-Head Soot Blower

By Robert June, M.E.

SOOT, it has been stated, is the best heat insulator known, being more than five times as effective as asbestos in preventing heat transference. Those who have to deal with the soot problem continuously, know that this statement is literally true. You can no more expect efficiency out of a boiler, the fire surfaces of which are coated with soot, than you can expect efficiency from a man with a bad cold. There is a congestion and bad circulation in both cases. If you want to keep up steam when the soot piles up on the boiler tubes, you will have to pile in more fuel.

Soot as found in steam boilers varies considerably in appearance and composition, depending upon the grade of coal burned, conditions of combustion, and part of the furnace from which the sample is taken. Nearest the fire the deposits formed consist largely of ash. Analysis of samples of soot, taken from a boiler, shows in addition to the " pure soot " the presence of silica, alumina, iron oxide, various alkalies and sulphur dioxide.

In all but the coolest portion of the setting, soot is usually gritty in texture. The grains may be as large as medium size sand, or as fine as cigar ash. These particles are in a plastic state when they leave the furnace, and striking the boiler they adhere to the tubes. If this deposit is not removed frequently it quickly increases in amount and changes in character. The carbon burns out in part and the mass cements together. The repeated reduction in heat-absorbing surface increases the temperature of the flue gases so that the process of cementation is continuous and constantly increasing in intensity. An extremely hard, clinker-like formation results. In a short time the tubes in some portions of the boiler are thickly coated, thus materially reducing its capacity.

The Five Essentials in Preventing Soot Waste

The five essentials in preventing heat waste caused by soot are:

(1) Frequency of cleaning in order to minimize the cumulative effects of increasing deposits. Tubes should be cleaned three or four times in 24 hours.

(2) Thoroughness of cleaning, in order to maintain high furnace and boiler efficiency, and prevent the corrosive effects of soot accumulation.

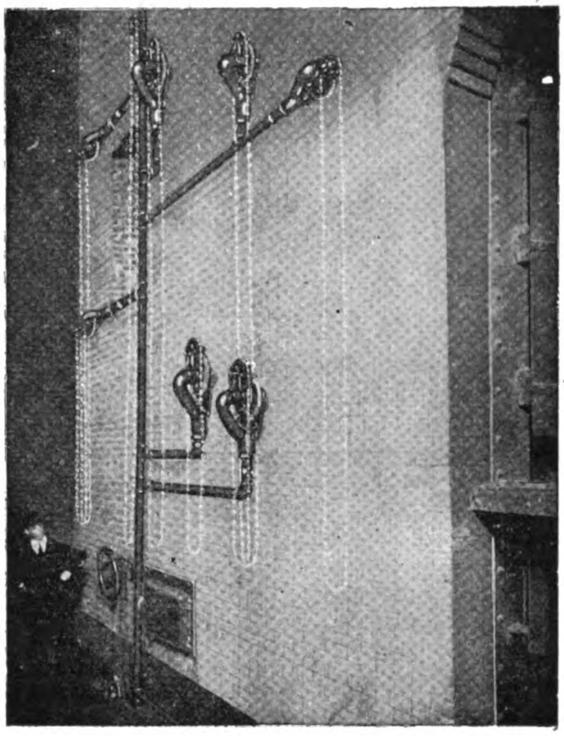


Fig. 1.

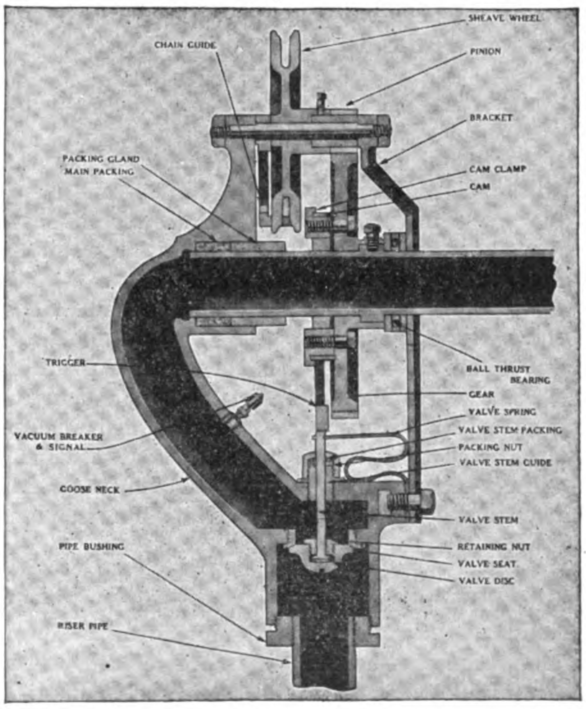


Fig. 2.

(3) Availability of system. The soot blower system should be instantly available, automatic in action, capable of being operated for an exact pre-determined period of time.

(4) Durability of system: The blower units should be so designed and constructed that they will withstand the stress of hard service without the necessity of frequent repair or replacement.

(5) Economy in Operation: The soot removing system should be cheaper in operation than hand blowing; it should be so installed as to prevent the entrance of cold air into the furnace during its operation, it should not interfere with the operation of the boilers, it should pay for itself from an investment standpoint.

The New Diamond Valve-in-Head Soot Blower

To meet the exacting requirements noted above, an entirely new principle has been introduced in soot blower design. The valve controlling the individual unit has been incorporated as an integral part of the head. This valve (Monel metal) is of the poppet type and is placed at the base of the gooseneck. This valve takes the place of the globe valve which has always heretofore been installed (at a distance of two to fifteen feet or more from the head) in the riser pipe leading from the main header.

The special valve just referred to is located at the point marked " A " in the illustration (Fig. 1). The unit is operated in the following manner: The main control and drain valves, which are the only independent valves on the soot blower line, having first been opened, and all piping drained and heated, dry steam fills the line to the entrance of the individual valve at the base of the gooseneck " A." The sheave wheel " B " (Fig. 2) is then revolved by pulling the chain. This turns a small steel cut pinion gear (not visible in the illustration). The small pinion engages the large gear " C " which is fixedly mounted on the blower element. As the gear is revolved it operates the cam " D " which causes the lever " E " to press down the valve stem " F," causing the valve to open at a pre-determined point in the revolution. After the gear has been further rotated, the cam " D " releases the lever " E " allowing the steam pressure to close the valve at a second pre-determined point in the revolution.

As the steam leaves the line the spring "C" holds the valve closed.

Construction of Valve

The valve is made with Monel metal disc and seat. Both the stem and its retaining nut are made of nickel steel. In order to secure extra hardness, which insures durability, the end of the stem is heat treated. A special feature is the provision of a guide on the seat which permits leaving the stem loose in the disc so that the valve will always seat properly. The entire construction is such that the troubles common to globe valves, such as "wire-drawing," leaking, etc., are almost entirely eliminated. Disc and seat are readily accessible so that they may be removed easily for re-grinding or renewal, should occasion ever require.

As the tendency toward high pressure and superheat is very marked in modern power plant design, the Diamond Power Specialty Corporation makes a special steel body Valve-in-Head soot blower for such boilers as require this type of equipment.

Advantages of this Type of Soot Blower

The advantage of the Valve-in-Head soot blower as compared to soot blowers of the independent valve type, fall into two general groups.

Direct Economic Advantages.

1. Labor—a saving of approximately 50 per cent.
2. Steam—a saving of 30 to 50 per cent. or more.
3. Pipe, Valves and Fittings—a saving of 50 to 66 per cent. in cost of pipe, valves and fittings.
4. Maintenance—a reduction in annual charges of 25 to 50 per cent. or more. Practically complete elimination of condensate obtained.
5. Efficenicy—greater cleanliness of boiler assured.

Indirect Economic Advantages.

The following advantages, while primarily of a mechanical nature, have an important dollars and cents value :—

6. Interchangeability—especially adapated to replace other blower heads.
7. One Model Standard—head is made in one size for all boilers.
8. Control—Steam may be intermittently discharged over two or more arcs in revolution. Arc or arcs of steam jets within boiler invariably cover exact pre-determined limits. Speed at which blower element may be revolved is so controlled by reduction gearing as to make improper operation extremely unlikely. Unit provided with visible and audible signal to indicate valve open.
9. One Direction Operation—revolution is always clockwise ; hence blower element cannot work loose from head either partially or entirely.
10. Ease of operation—gearing and ball thrust bearings overcome friction.
11. Valve Design—time of opening and closing exactly adjusted to soot blower operating conditions, being slower than the standard quick-opening valve, and faster than the standard globe valve, thus solving a problem of long standing. Quick-opening valves have the advantage of causing a sharp thrust of the unit, due to rapid admission of the steam. With globe valves, the tortuous passages cause marked reduction in effective pressure. There are also losses of time and steam, from the slow opening and closing—losses which seem of small amount as respects a single operation, but which become important when spread over a period of time and a number of boilers.
12. Practical elimination of the possibility of water entering the portion of the soot blower inside the boiler.

It has been demonstrated repeatedly by practical experience in the largest power plants in America that Diamond Valve-in-Head soot blowers will effect such important economies as—a saving of 4 to 8 per cent. in fuel—an increase in over-all efficiency of 3 to 4 per cent.—a decrease in consumption of steam required for cleaning, and—a marked saving in labor and labor turnover.

Diamond Soot Blowers

Diamond Power Specialty Corporation, Detroit, Michigan, U. S. A. are the exclusive manufacturers of Diamond soot blowers in the United States, having purchased as of March 1st, 1922, the entire plant and the good will of the Diamond Power Specialty Company, a co-partnership, the members of which retire from the soot blower business in the Western Hemisphere.

Diamond soot blowers as made by the Diamond Power Specialty Corporation are the original Diamond soot blowers which have been produced in Detroit for the past twenty years. These Diamond soot blowers are adapted to all types of high pressure steam boilers for both marine and land power plants. Saving in fuel, labor and steam is effected by their use and boiler efficiency and capacity are increased.

The Asahi Petroleum Company

THE Asahi Petroleum Company, Ltd. has absorbed the Imperial Petroleum Company and recently paid a 15 per cent. dividend, which has been in operation for four years and a half. The merger is intended to control the petroleum market in Japan.

Among the oil wells owned by the Asahi Petroleum Company is the Akita well which had so large a flow at first that the company was unable to take care of it. The opinion of experienced engineers and petroleum specialists is that the supply of this well is almost unlimited. Besides this, the company owns other wells with very promising futures.

From December 1st, 1921, to May 31st, 1922, the company made a gross profit of Y.471,637 and excluding amounts set aside for redemption of fixed capital, net profit amounted to Y.391,637, and a dividend at the rate of 17 per cent. per annum was paid for the term. It is said that the methods of calculation of this company are in accordance with the most approved systems, and that if they had ambitions to pay higher dividends, 20 per cent. would have been quite possible by changing the method of accounting.

The main officers of the company are well known as expert oil men. The president is Mr. Kojiro Matsukata, head of the Kawasaki Dockyard Company. Managing director, Mr. Inojo Seshima, was former president of the company, and Mr. Oka was formerly managing director of the Imperial Petroleum Company. The other officers are: Directors: M. Naruse, M. Yotsumoto, H. Minagawa, K. Nagatome, K. Fujita and R. Miyao ; Manager : E. Inoue; Auditors : R. Iwatate, S. Okamoto and E. Nagasaki.

The head office of the company is at No. 1, Itchome, Yurakucho, Kojimachi-ku, Tokyo.

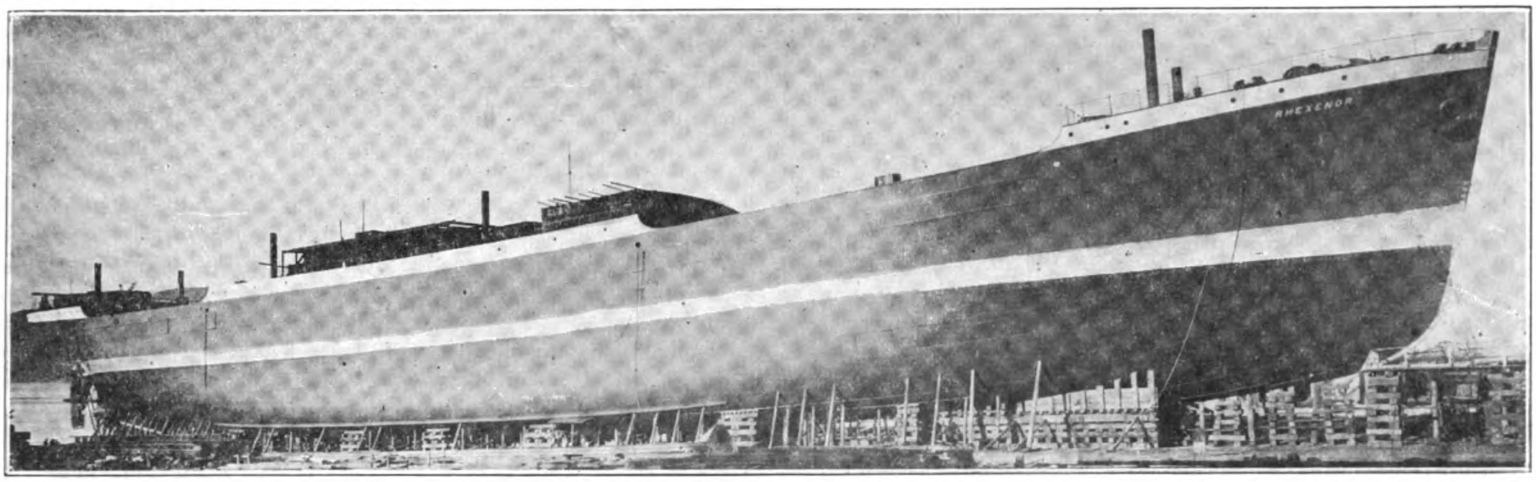
Daido Electric Transmits Power 160 Miles

ON July 1st, the transmission equipment of the Daido Denryoku K.K., from its power plant on the Kiso River to Osaka city, was experimentally opened. A total of 77,000 volts was successfully transmitted, with results better than the company had expected. On the twenty-first, 22,000 kilowatts were supplied to the Osaka Dento K.K., Keihan Dentetsu K.K., and the Kyoto Dento K.K.

The equipment of the Osaka transformer station is of the latest type for regulating current transmitted over long distances. At the end of August the 12,500-kilowatt coal-burning power plant at Keima will be completed. This power will be used for reserve, so that when water is low in winter the company will have sufficient power for all its needs.

Three power plants of this company will be completed as follows ;

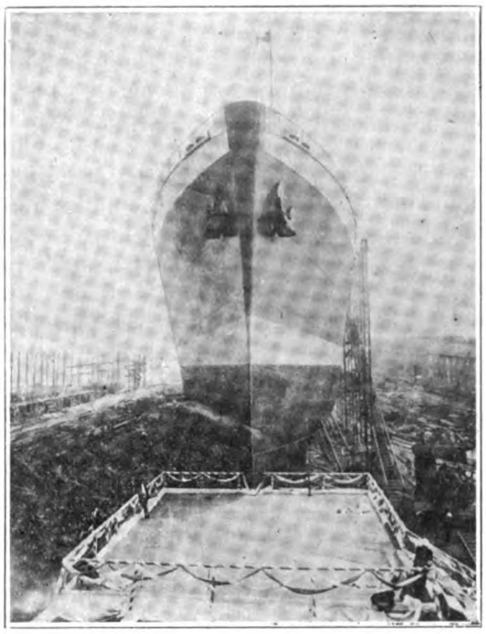
(1) Dokusho Power Plant, capacity 40,700 kilowatts. To be completed, August, 1923.
(2) Momoyama Power Plant, capacity 23,700 kilowatts. To be completed, October, 1923.
(3) Oi Power Plant, dam type, 42,900 kilowatts. To be completed, March, 1924.



The s.s. " Rhexenor," a 10,000-ton freighter built at the Taikoo Dockyard at Hongkong for Messrs. Alfred Holt & Co.

A "Blue Funnel" Launching at Hongkong

ANOTHER addition to the "Blue Funnel" fleet of Messrs. Alfred Holt & Co. was successfully launched at the Taikoo Dockyard in Hongkong on June 29th. The naming ceremony was performed by Mr. C. W. Beckwith. The principal dimensions of the vessel are: Length over-all 477-ft. 6-in., breadth over-all 58-ft. 4-in. and 35-ft. 3-in. depth to upper deck from bottom of keel, the total gross tonnage being 8,040, and deadweight carrying capacity will be about 10,000 tons. The *Rhexenor* has two complete decks with an orlop deck forward, poop, bridge and forecastle and citadel deckhouse at fore end of bridge, two pole masts and ten derrick poles, also six cargo hatches. The vessel has a raking stem, elliptical stern, and cellular double bottom all fore and aft, the wings of which have been carried well up the sides of the vessel. Eight watertight bulkheads are carried to the upper deck, giving the vessel six cargo holds. The space under the forecastle has been fitted up for emigrants, while the space under the poop has been utilized for the accommodation of sailors and firemen. Petty officers' rooms are on the bridge deck alongside the engine casing. In the citadel house at the fore end of the bridge deck, the saloon, engineers' rooms and three staterooms have been arranged, and on the deck over the saloon is a steel house containing the captain's day and night cabins, also four rooms for officers. Over this house again is the navigating bridge with wheelhouse and chart room. The vessel is supplied with eighteen steam winches with derricks carrying loads varying from 2 tons to 40 tons. A powerful Marconi wireless apparatus is installed, with suitable rooms for the operators.



Bow and Stem View of the s.s. " Rhexenor "

The machinery consists of one set of Parsons latest turbines driving through double reduction gearing and capable of developing a total shaft horse-power of 6,500. Steam is supplied to the turbines by two large double-ended boilers, one single-ended auxiliary boiler is also provided, and all the boilers have a working pressure of 220-lb.

Electric light has been fitted throughout the ship.

When completed and on service the *Rhexenor* will attain a speed of 14 knots.

Industrial Development of Hokkaido

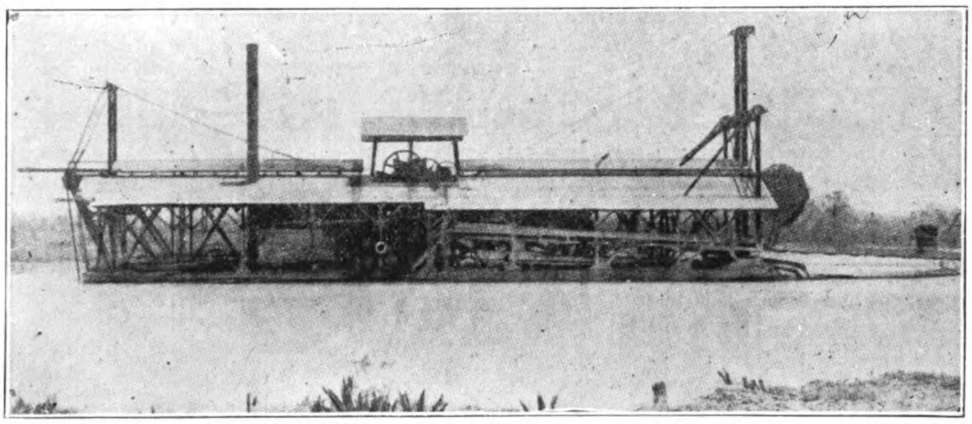
The principal industries of the Hokkaido, the most northern of the main islands of the Japanese empire, are fisheries, lumbering and paper making. The merchants of Hokkaido display a keen interest in business and give a quick interpretation to business problems.

The ports of Hakodate and Otaru afford excellent harbor facilities. All cargoes, except a few of lumber and fish, from these ports load for transhipments at Yokohama or Kobe and for that reason the cargo movement is confined to the Japanese coastwise trade. These cities have a population of more than 100,000 and afford an excellent market for the specialty trades. The city of Sapporo has, in addition to government headquarters, the Imperial Agricultural College. This college means a great deal to the future development of Hokkaido and each year there is an increased development in agricultural pursuits. The Oji Paper Co., at Tomakomai, is the largest paper company in Japan and operates a complete unit, including the cutting of timber from its own forests, the development of hydro-electric power which supplies not only its own plant and near-by villages but the cities of Sapporo and Otaru as well, and the production of its own sulphur and lime supplies.

F.M.S. Mining and Engineering Notes

62 Tin Dredges in Malaya

IN 1914, there was only one bucket dredging proposition of any magnitude in the F.M.S. In that year the Malayan Tin Dredging Co., Ltd., started with one dredge in operation one under construction and four projected. By the end of 1920 there were 30 bucket dredges in operation and with 22 proposed and under construction. Including the ten dredges working in the Siamese tin fields adjacent to the F.M.S., this makes a total of 62 dredges operating and proposed in the Malay Peninsula, a development that has taken place within the past six years. If we add to this the number of gold dredges working in the Philippines, Korea and Siberia, the Far East takes its place as one of the most promising markets for dredges in the world.

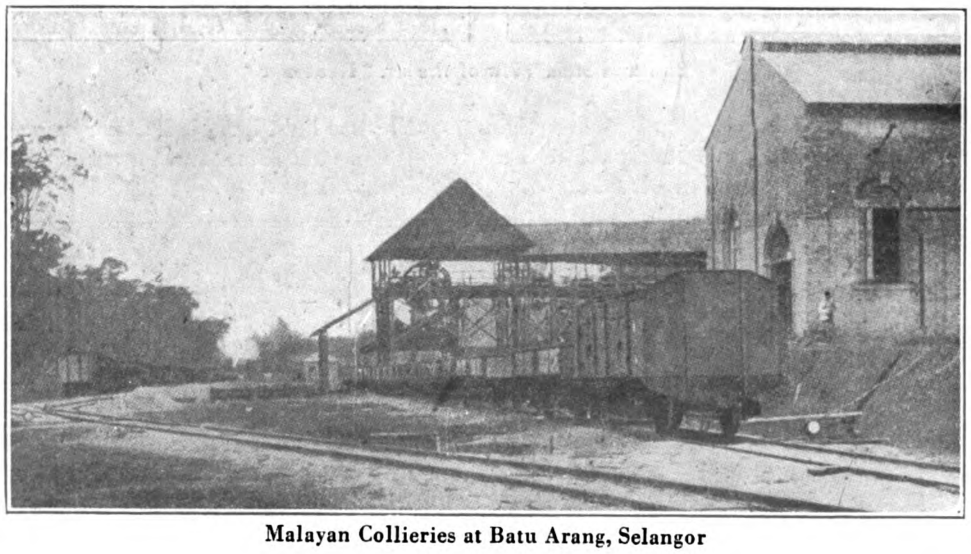


Type of Tin Mining Bucket Dredge in use in the F.M.S.

The annual report of the F. M. S. mines department for the year 1921 makes rather depressing reading in regard to tin output and prices. The following figures tell the story of how the slump has affected the tin industry of the peninsula :—

Year	Ore price. $ c.	Received by miners. $ c.	Duty $ c.
1915	54.72	45.65	6.77
1916	61.27	51.35	7.82
1917	78.29	61.30	12.56
1918	108.45	85.32	18.45
1919	86.89	71.40	12.00
1920	108.48	89.00	15.60
1921	61.20	49.72	7.68

Miners received less per picul in 1921 than at any time since 1915. The report says : "The outstanding feature and chief contributing cause of the low price prevailing throughout the year has been the abnormally low consumptive demand. As no corresponding decrease in production occurred a large accumulation of stocks both in producing and consuming countries had resulted by the end of the year. Until these stocks are liquidated no permanent improvement in the price can be anticipated and any attempt to unload part of these stocks at the present juncture will, no doubt, seriously retard the recovery in the price. At the close of the year conditions in the tin plate industry, which, at the beginning of the year were very bad in America and the U. Kingdom, had improved considerably. It is assumed this improvement will continue, necessitating a stronger demand, this, combined with the better labor outlook in evidence during the latter part of the year and a revival in trade conditions generally should take the price to a higher level during the ensuing year. No very marked advance in the price, however, can be expected to eventuate until the American consumption, which was very poor during the year, again approaches the normal, and the continental demand approximates its pre-war level."



Malayan Collieries at Batu Arang, Selangor

The production of tungsten ores has sunk to 55 tons while the quantity of gold placed on the market was 14,674 ounces valued at £59,097, of which, the Raub mine produced 14,430 ounces.

Malayan Collieries

The bright spot in F.M.S. mining was the coal output from the Malayan Collieries, Limited, whose mine is located at Batu Arang in Selangor. This mine seems to have fully justified the expectations of its promoters, the production for the year under review being 299,351 tons, an increase of 51,434 tons over the preceding year, making a total of 1,175,950 tons since production commenced in 1918. The principal consumer is the F.M.S. railways which took 144,934 tons, the mines 92,728 tons, other F.M.S. industries 12,874, leaving 49,263 tons which were exported.

The main seam of the Rawang coalfield contains 10,000,000 tons of marketable coal, and the area of the mine is 1,800 acres held under lease and 20,000 acres under prospecting license. The surface plant comprises a boiler house with two Babcock and Wilcox boilers with patent step-grate furnaces giving a heating surface of 2,531 square feet, to each boiler, and having an induced draught Sirocco fan, 40-in. in diameter, direct coupled to high-speed steam engine, this fan being capable of giving 2-in. draught with three boilers under full power. The feed tank capacity is 30,000 gallons. The main engine house,

comprising the haulage engine section, has two double-drum haulage engines, with loose drums, geared 3 to 1 for fast haulage and each engine has cylinders 12-in. diameter by 24-in. stroke while the electric generator section has two 100 kilowatt sets, 500 volts direct current, compound wound, interpole dynamos, by Mather and Platt, Limited, these being direct driven by high-speed compound steam engines. The switchboard contains two generator panels, with overload and reverse current circuit breakers and equalizing switches, and one feeder panel, with four distribution switches, while the motor-generator is 500 volts to 100 volts and is for electric lighting.

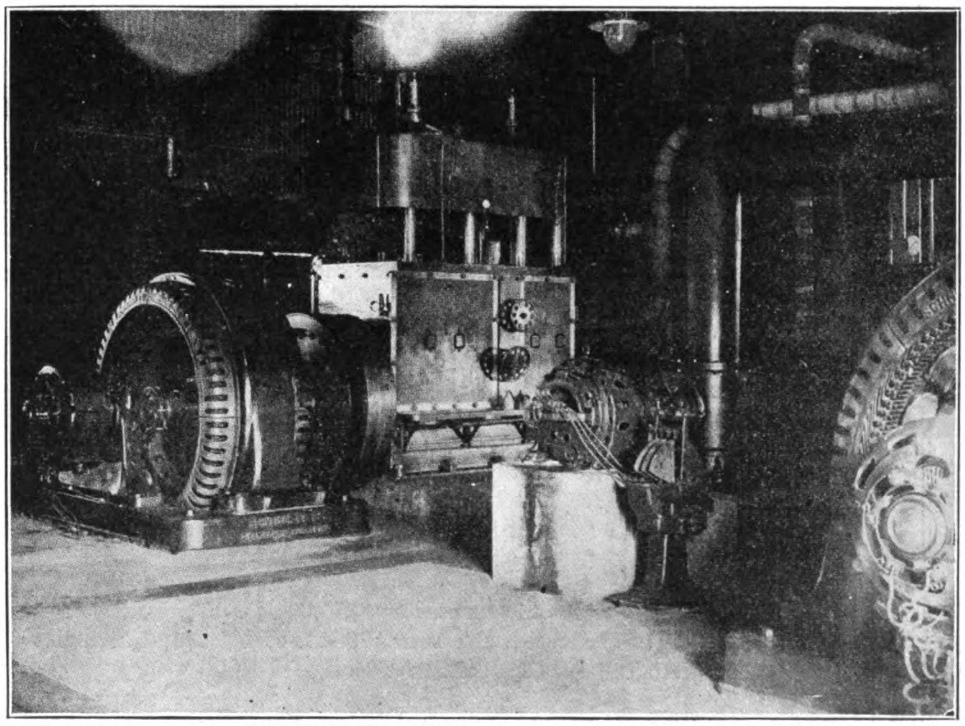
All cables carrying current to the mines, fan and shops are special tropical twincore paper-insulated, lead-covered, laid in bitumen in stoneware troughing ; but those carrying current in the mines are armoured, and suspended from the timbers.

The ventilating fan is 36-in. diameter and is of the "Turbon" mining type capable of passing 20,300 cubic feet of air at 4-in. water gauge.

The loading stage is a temporary structure of timber and the coal after being weighed is tipped on a screen which produces two sizes of coal while the mine has one-and-a-half miles of track connected with the F.M.S. railways near Batu Arang station. The sidings near the Heapstead have a grade of 1 in 90 to facilitate handling of waggons and a 60-ton weighbridge was installed by the F.M.S. railways.

The 1921 report shows that the mine operated with 1,891 horse-power and the labor force averaged about 2,700 men. The north and south mines and open-casts Nos. 5 and 6 were operating on the top seam while open-casts Nos. 1 and 2 were operating in the bottom seam. The top seam, therefore, supplied 170,956 tons or 57.11 per cent. of the output and the bottom seam 128,395 tons or 42.89 per cent. During the year 2,652-ft. of development driving and 1,500-ft. of cross-cutting were completed.

Considerable advance was made with the hydraulic stowage scheme and the practice of replacing coal won by sand stowed hydraulically is now well established. It is intended to extend the principle and with this end in view a new sand bunker was laid down at No. 6 shaft. This bunker measures 94-ft. by 21-ft. and will hold 1,000 cubic yards of sand, which quantity can, if necessary, be flushed into the underground workings in the space of four hours. A dam for storing "flushing water" has been excavated and an 8-in. electrically driven turbine pump for taking care of the flushing nozzles has been installed near by. To deal with the drainage underground from the stowage operations, a 6-in. electrically driven turbine pump has been installed in the north mine housed in a chamber 72-ft. long by 12-ft. wide and by 12-ft. high, walled and arched throughout with brick.



A Tin Mine Power Plant: Societe des Etains de Kepong. Schneider et Cie, Generators

Batu Caves Cement Works

The Batu Caves Portland Cement Works' (Selangor) operations were as follows, in tons, for the last three years :

Year.	Limestone.	Cement manufactured.
1919	6,786	4,395
1920	7,372	5,451
1921	6,048	1,768

all of which for the year under review was used locally and shows a decrease of production of 3,683 tons as compared with 1920.

Machinery and Hydraulic Appliances on Mines

The toal effective horse-power of steam, gas, oil, hydraulic and electrical plant employed on mines in the year under review is estimated at 59,200 (including Raub mine and the colliery) and is classed as follows :

State.	Steam.	Steam-electric.	Hydraulic.	Hydro-electric.	Suction gas.	Oil engines.	Oil-electric.	Total, 1921.	Total, 1920.
Perak	16,550	1,339	14,322	2,524	621	874	1,800	38.030	40,990
Selangor ...	7.034	900	1,042	...	383	176	1,200	10.743	13,145
Negri Sembilan	950	...	413	...	...	...	...	1,363	1,372
Pahang ...	4,108	...	1,687	2.022	52	195	1,000	9,064	8,853
Total, 1921 ...	28.642	2,239	17,464	4,546	1,056	1,245	4,000	59,200	64,360
" 1920 ...	29,889	3,652	18,859	4,637	1,993	3,730	1.600	64,360	
" 1919 ...	25,826	2,771	17,497	4,686	1,811	2,552	2,200	57,343	

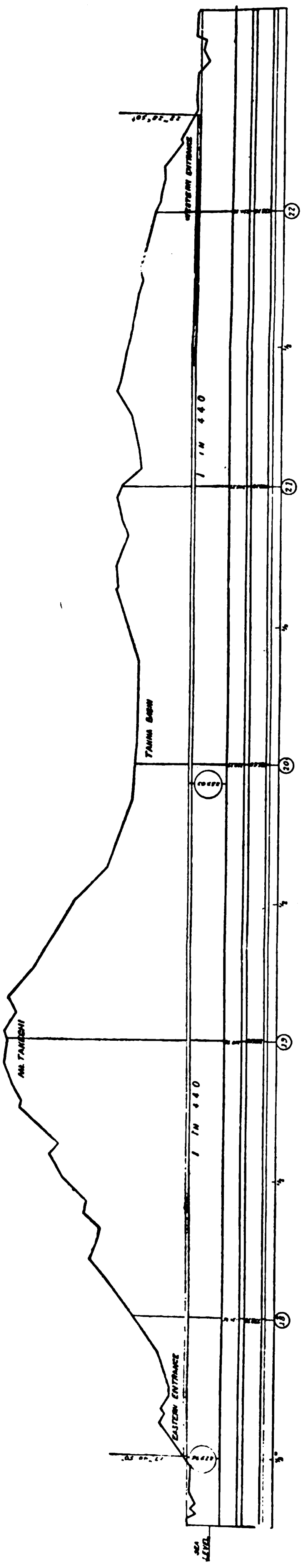
a decrease of 5,160 horse-power as compared with the previous year.

Steam and Other Plants

The increase in the use of machinery in the F.M.S. is seen in the number of plants under inspection. The total horse-power of plant installed and registered under the machinery enactment is 136,459 (inclusive of hydro-turbines aggregating 3,460 h.p.), of which, 83,125 h.p. was in employment. The number of boilers registered and under inspection totals 2,053 with a collective h.p. of 90,291. The horse-power of steam plant in employment in the year aggregated 46,182 and that of unemployed 44,109. There were 997 oil engines with an aggregate h.p. of 25,335 and 313 gas engines with a total of 17,087 h.p. Five hundred and forty-seven installations of machinery were inspected during the year, a decrease of 21 installations as compared with 1920.

Electrical Installations

For generating purposes at the end of 1921, there were 101 installations with a total of 11,983 kilowatts distributed as follows: Perak, 65 installations, 7,097 k.w. ; Selangor, 27 with 1,789 k.w. ; Negri Sembilan, 6 with 79 k.w. ; and Pahang 3 with 3,018 k.w. The distribution of electrical supply shows that over 90 per cent. (11,316 k.w.) was employed in the mining industry, 338 k.w. in agriculture, 264 k.w. in general use and 65 k.w. by the government. The classification of all electrical generating plant employed in the F.M.S. shows that 11,509 k.w. are used for power and 3,215 k.w. for lighting, of which capacity, 11,000 k.w. of power are used by the mining industry alone. The total horse-power of motors connected was 12,659.



Profile of the Atami Tunnel Cutting

The Atami Tunnel

By H. C. Huggins

THE greatest engineering work now under construction by the Imperial Japanese Railways is the Tanna tunnel (more commonly known as the Atami tunnel), a preliminary to the electrification of the Tokaido line operating between Tokyo and Kobe, cut through one of the most volcanic regions of Japan. When completed, it will save seven miles of track on the main line of the Tokaido and eliminate the tedious haul over the Hakone mountains between Kozu and Numadzu.

The peculiar nature of the soil in which excavations must be made demanded a most careful survey by the greatest geologists in Japan. The first survey was completed in 1915 by Dr. Matajiro Yokoyama, professor of the department of science in the Imperial University of Tokyo, who reported as follows : " The Tanna basin is the crater of an extinct volcano. The bottom of the crater was once a lake, the water having drained off through some outlet to the west. It is difficult to ascertain the thickness of the strata of mud at the bottom, of the crater, but as the deepest well in the neighborhood is only 33-ft. deep, it is possible to conclude that the mud ceases at that depth, and that beneath it lies a strata of congealed lava.

In November 1915, Dr. Satoshi Suzuki, a noted geologist, also submitted a report on the geology of the district, somewhat in contradiction to that of Dr. Yokoyama, but substantiating his opinion that it was safe to construct a tunnel through the district, if it were excavated at not less than 500-ft. below the bottom of the extinct crater.

On the basis of these reports, the engineers of the railway bureau made their plans, and in March, 1918, construction work was begun with an appropriation of Y.53,000,000 by the imperial diet. Since then the work has continued without interruption, except for minor difficulties, as when the tunnel caved in last year burying some tens of workmen, many of whom were saved by the bravery of their gang boss.

The eastern entrance of the tunnel is at Atami-machi, Shizuoka prefecture, and the western entrance at Kanna-mura, Tagata-gun, Shizuoka prefecture, passing through the Hakone mountains, a distance of 4 miles and 68 chains, from entrance to entrance. The railway line will be double track, completely electrified. The width of the tunnel is 28-ft., height 22-ft. 6-in., area 544 square feet. It is built in the midst of old volcano craters, and many times work has had to be abandoned for a time, because of the breaking out of hot springs, geysers, etc.

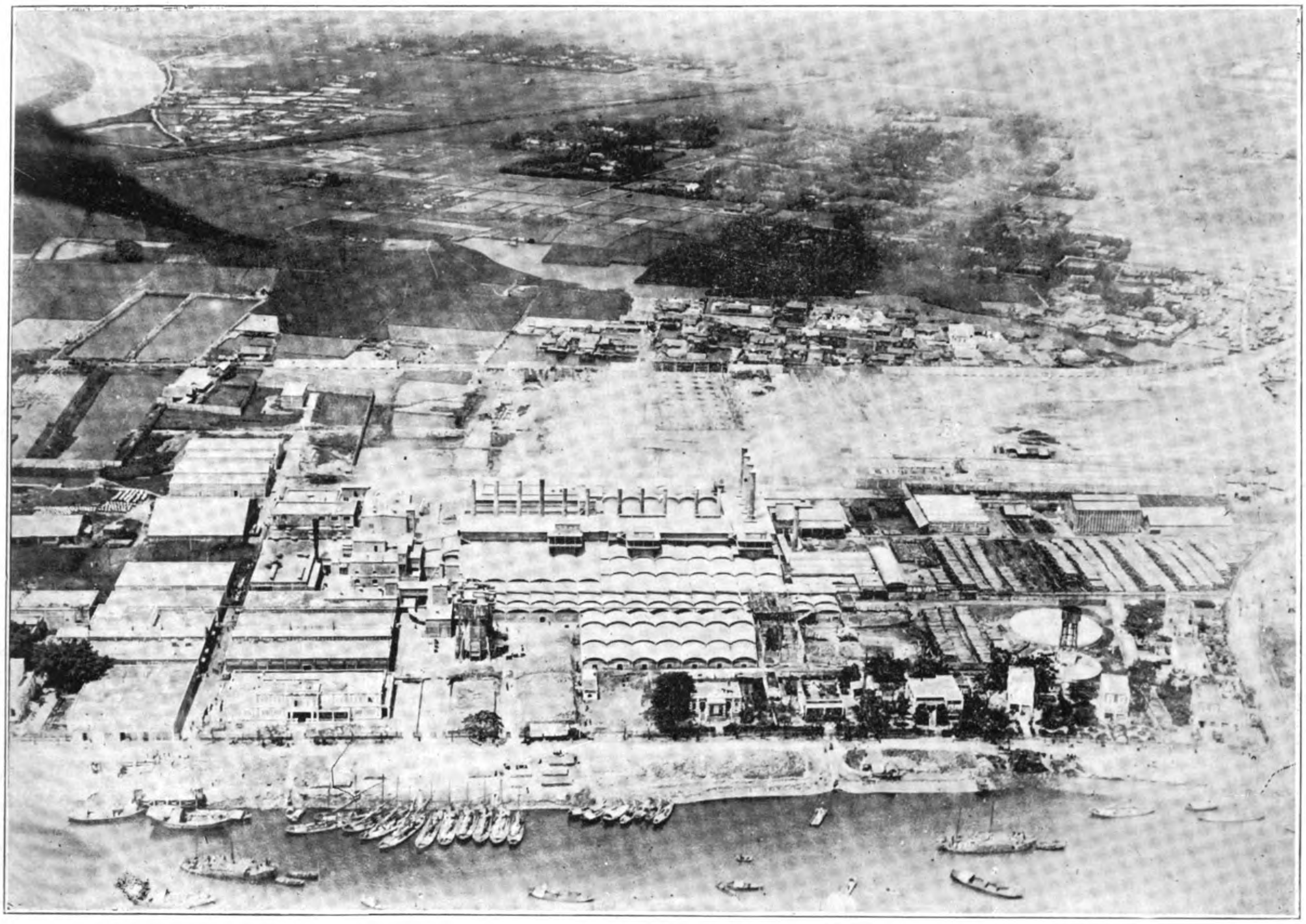
The transport of building materials, and removal of the excavated material is done by means of a light gauge railway (2-ft. 6-in.). A part of the railway is electrically operated, but in that part nearest the excavations the cars are pushed by hand. Air is supplied by ventilating equipment, which transmits 5,000 cubic feet of air a minute into the interior of the tunnel. A partial change of air is also effected by the exhaust from the compressed air of the rock drills.

All machinery used in construction is electrically operated. At the western entrance there is a coal-burning power plant equipped with four steam engines of the "Taguma" type, with a capacity of 1,600 h.p., and also a Parsons turbo-generator 3-phase, 2,200 volts, 2,500 kilowatts, 50 cycle. This plant transmits all the power used in operations, and supplies electric lights for both entrances of the tunnel, and for the outside as well.

At the east entrance 350 workmen are engaged, and at the west entrance 450. On July 1, 1922, at the east entrance (Atami) 4,468-ft. of excavation had been completed and the surface had been leveled for track construction for a distance of 2,218-ft. On the wall of the tunnel 1,968-ft. of concrete work, and 1,881-ft. of brick arch wall had been finished.

At the west entrance (Kanna), 4,940-ft. of excavation, 4,210-ft. of surface levelling, 3,993-ft of concrete work and 3,700-ft. of brick and artificial stone work had also been completed on July 1, 1922.

When the tunnel is completed in March 1926, it will be the most important link in the great plan for the complete electrification of the main line of the Imperial Government Railways.



Aeroplane View of the Haiphong Cement Works in Indo-China

The Haiphong Cement Works

THE SOCIETE DES CIMENTS PORTLAND ARTIFICIELS DE L'INDO-CHINE was founded in 1899 and the first stone of the works laid down the 25th of December of the same year.

The raw materials necessary for the fabrication of cement are found plentifully in the vicinity of the plant at Haiphong; these materials had been studied very carefully and, only after numerous analyses, the society purchased the important deposits containing the best limestone in the country, more particularly the deposits of the "Ile des Deux-Songs" in the province of Quang-Yen.

The preparation of the materials is carried out by the dry process; the clay drawn out from the bed of the Cua-Cam River is completely dried, then mixed in suitable proportions with the limestone crushed by means of powerful crushers; the whole is then very finely ground, so as to obtain an impalpable powder, the composition of which is rigorously constant.

The powder compressed into bricks is burnt in fifteen vertical kilns of a very improved system so as to enable the plant to produce a cement perfectly homogeneous. The burnt cement is ground again in powder and the finished product is packed in bags or barrels.

The driving power necessary for the whole plant was originally about 1,200 h.p. This first group was soon increased by two turbo-alternators of 1,200 h.p. each, constructed by the "Société Alsacienne de Constructions Mécaniques" at Belfort. The building for the turbo-alternators was erected in prevision of a third one of 3,000 h.p., actually in course of installation, and necessitated by the important extensions now being carried out.

The grinding of the raw materials and of the cement was originally done by means of nine groups of preliminary crushers and tube-mills; later five other grinding works were installed including two compound-crushers and three "Centaure" crushers, each of which is directly driven by an electric motor; these "Centaure" crushers are of the most powerful type; they allow obtaining easily a cement of a very great fineness, an essential quality of Portland cement.

Several chemists constantly working in the laboratory of the factory supervise all phases of manufacture.

The cement sold by the plant at Haiphong is equal in quality to the French and European brands of world-wide reputation. The results of the tests effected in the various official laboratories show that the cement possesses a very high compressive as well as tensile strength. The constancy of volume being absolute proves a quite thorough mixing of all elements.

The cement of Haiphong meets the requirements of all specifications and contracts; it is particularly suitable for all works requiring a product of high-grade quality such as reinforced concrete structures, flagging, etc.

The board of public works in Indo-China has used a very large quantity of Haiphong cement specially for the construction

of the railways of Tonkin, Cochin-China and Yunnan; this board having permanently a surveyor at the factory, it can be said that the manufacture is done under its control. Many tests have been made by this board.

The artillery board also uses Haiphong cement for its construction work.

Buildings of reinforced concrete of great magnitude have been erected with the cement of Haiphong, among which dams and landing-wharfs for the coal-mines of Tonkin at Hongay; the market-halls of Saigon, the sheds of which have an 84-ft. span without intermediate supports; numerous bridges at Bangkok; the Royal Palace at Bangkok remarkable by a consolidation of reinforced concrete; storagebins for limestone and clay supporting on the top two bruising mills of the greatest size, the whole construction with the raw materials contained weighing 1,080 tons is supported by 16 columns of reinforced concrete of 14-in. diameter.

The good behavior of the cement of Haiphong in sea water has been equally shown by numerous and conclusive experiments carried out by the laboratory of the board of public works.

The Haiphong Cement Works not only send their products all over Indo-China, but they ship considerable quantities into other countries, China, Philippines, Siam, Netherlands India, Singapore, etc.

The present production capacity is 150,000 tons. This will be shortly doubled by a new factory, now in course of building, furnished with the most up-to-date equipment, more particularly six compound-crushers "Centaure" and eight kilns P.C. with automatic discharge and large output, of the most improved type. It is therefore one of the most important industries of Indo-China and of the whole Far East; after carrying through all the new instalments, the factory will take place among the most important cement works in the world.

A workshop provided with the most perfect equipment for manufacturing barrels is attached to the plant, the timber of the country is used for it, as it was found quite appropriate for this purpose. Owing to the necessary enlargement required by this workshop, it will be rebuilt to include saw-mill and cooperage, fitted transforming into barrels more than six hundred logs of timber a day.

The board of this important society is composed as follows: Messrs. E. Candlot (Président) and R. Ferrant (Membres du Comité de Direction), Ch. Candlot, F. Lebreton, L. Marchegay, N. Perpignani and R. Thion de la Chaume and as general secretary, Mr. Ch. Thomonn, ingénieur des arts et manufactures.

The general direction was assumed, in the beginning, by Mr. N. Perpignani, and afterwards, during more than twenty years, by the late Mr. J. Barriere; the actual general manager is Mr. G. Chenu, ingénieur E.P.C.

The Société des Ciments de l'Indo-Chine obtained a "Grand Prix" at the exhibition of Hanoi in 1903; a "Grand Prix" at the exhibition of Marseilles in 1906, at the exhibition of Liège in 1904 the society was hors concours, membre du jury.

Unfair Competition Forbidden by Law

WRITING in the *Dodge Idea*, Mr. Ralph J. Butz defines the law on unfair competition and answers some questions which apply to every line of business where an established name is used by a competitor in confusing the public. Mr. Butz says:

"Unfair methods of competition have been the cause of many cases in the courts, and during the last ten years especially, various state and federal laws have been enacted for the protection of the business man who suffers as a result of unfair methods practiced by his competitors. Federal and state authorities are also, as far as is practicable, lending their assistance to overcome this evil.

"The methods practiced by competitors of this class are, of course, as many and varied as their ingenuity can devise. However, one of the most common methods resorted to, is the use of the trade name and private brand of a successful firm, and to leave the purchaser under the impression that he is getting the article which is well known and favorably regarded. This deception is practiced by marking the goods with the mark by which they have always been known to the trade, or placing by them in containers similar to the ones used by the firm whose reputation for the goods has been established.

"When such deception is practiced by a competitor, confusion is likely to result, and it will undoubtedly work to the injury of the firm whose trade name and private brands have become favorably known to the public through years of satisfactory and successful service.

"On this point the law has been stated very plainly in the following manner: 'A dealer, coming into a field already occupied by a rival of established reputation, must do nothing which will necessarily create or increase confusion between his goods or business and the goods or business of his rival.'

"Also, 'Irrespective of the question of trademark, a manufacturer has no right to inclose his product in packages so like those of a rival manufacturer as to deceive a purchaser, or to enable a dealer to do so.'

"The principle prohibiting unfair trade methods applies to every line of trade. Every man in business has a perfect right to carry on spirited competition with other business men, and the law cannot by any means be construed as opposing competition. It is only when one business man's false pretenses tend to mislead customers and to work harm to a rival that the law will interfere. And this interference by the law is entirely justifiable for when a business man or firm has spent years in development of its trade, then they should be protected against the wanton misuse of trade names and private brands which have become known to the public only through the expenditure of much energy and advertising.

"In another case where a defendant used unfair methods against an established rival, the court said: 'The test is whether the label or mark is calculated to deceive the public, and lead them to suppose they are purchasing an article manufactured by a person other than the one offering it for sale. It may be stated broadly that any conduct, the natural and probable tendency and effect of which is to deceive the public, so as to pass off the goods of one person as that of another, constitutes actionable unfair competition.'"

Even the Lumber Men Protest

IN a very exhaustive survey of the export lumber trade of the Pacific Northwest written by Frank Foster for the *West Coast Lumberman*, he nails the lies that were circulated about the use the Japanese were making of the large imports of cedar from Pacific coast ports.

"A particularly active form of propaganda being carried on by them just now is that of stirring up ill-feeling against those nations with whom it is all-important that we should have a good understanding. Among the criminal and potentially criminal classes that form the larger part of their readers there is a dim idea that the abuse of other nations is evidence of patriotism toward one's own. Now trading with foreign nations is based very largely on mutual confidence; and the propaganda carried on by certain newspapers in this country against the Japanese is distinctly hostile to our trade with Japan. The dense ignorance of the matter in hand that is sometimes displayed in these acrimonious comments is hardly complimentary to the intellect of the reader; but it seems to be good enough for them or it would hardly continue.

"On one occasion a warning note was sounded concerning the immense quantity of cedar (eleven million feet or more) which had been shipped to Japan from this coast, ostensibly for the manufacture of lead pencils, but really for the construction of bomb-carrying airplanes to devastate our coast cities. It must be admitted that eleven million feet of suitable lumber would build some fleet of airplanes; say about thirty thousand. But red cedar is a brittle wood, and the wood for airplanes must be of the toughest and most elastic. Some of us remember the difficulty there was in getting even spruce of the requisite grade for the purpose. Moreover, the vibration of an airplane presents some exceptional difficulties to be overcome in its construction. Red cedar has a rather exceptional feature itself; it is so susceptible to vibration as to be unsuitable for the temporary ties used on logging roads because the vibration of the rails will loosen the spikes. It has no "holding" quality. Imagine such a wood used in the construction of an airplane! Yet the readers of this alarmist literature apparently accepted the statement as an incontestable fact."

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Sir W. G. Armstrong Whitworth & Co., Ltd., well-known shipbuilding and armament manufacturers of Newcastle-on-Tyne, are the latest British engineering contractors to interest themselves in the possibilities of China as an outlet for their varied and comprehensive products, and an office has been opened in Peking which will be under the direction of Mr. R. A. S. Waters, their resident representative in China.

This firm is in a position to undertake contracts for the construction and equipment of harbor works, docks, railways, canals, bridges, etc., and many of the largest schemes in the world have been carried out by its civil engineering department.

Messrs. Reiss & Co. have been appointed their sole agents for the whole of China and Hongkong.

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

ENGINEERING PROGRESS IN KOREA

RAILWAYS IN THE HOKKAIDO

ELECTRICAL DEVELOPMENTS IN JAPAN

TIN MINING IN CHINA

CONSERVANCY WORK IN CHINA

BUILDING PORTS IN MALAYA

FAR EASTERN MOTORS

Vol. XVIII | September, 1922 | No. 9

A. L. TAYLER

FIRST in the Field—

FIG. W4161. Nos. 0 to 1¾, without Leader Screw

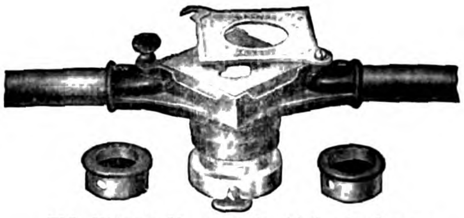

FIG. W4162. Nos. 2, 3, 4, with Leader Screw

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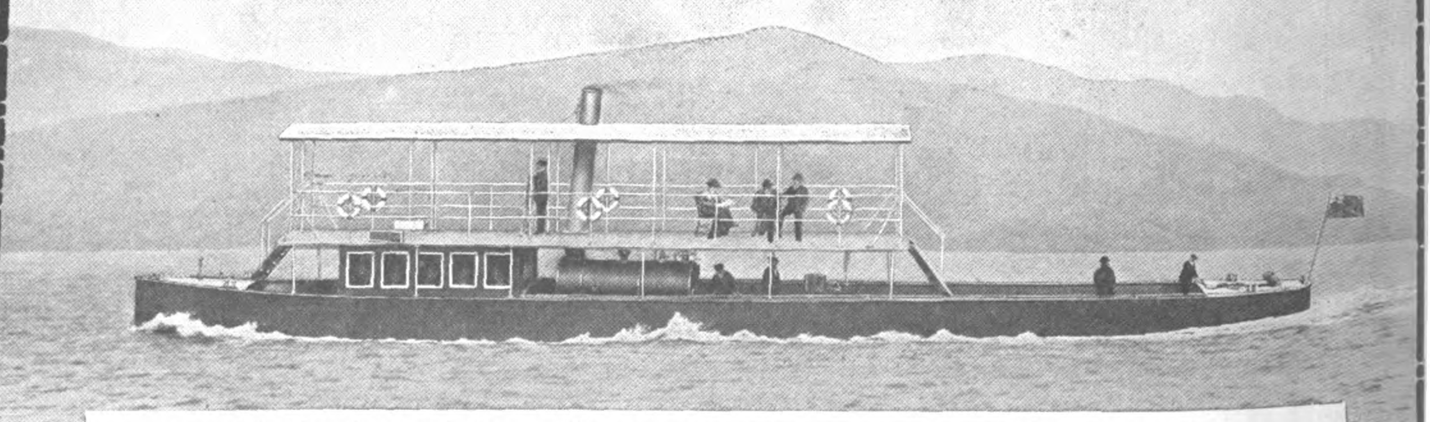

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, SEPTEMBER, 1922 No. 9

Engineering Progress in Korea

The Advance of Industry and Public Works in the "Land of the Morning Calm"

Harbor Improvements

DURING the protectorate *régime* a sum of over Y.4,000,000 was allotted in the budget for building customs piers in eleven harbors, viz., Fuzan, Jinsen, Chinnampo, Heijo, Genzan, Shingishu, Gunzan, Moppo, Seishin, Joshin and Bazan, and while work was still going on in such important harbors as Jinsen, Fuzan and Chinnampo, the treaty of annexation was signed, in consequence of which the government-general took over all these works, enlarged their scope, and has all but completed them, except in Genzan where the work was not begun until the fiscal year 1915.

(*a*) FUZAN

The scheme for Fuzan was to construct two iron piers, adjust the landing-place, and dredge the harbor. Pier No. 1 was finished in March, 1912. It is 152 *ken* long and 12.7 *ken* wide, and can accommodate at the same time two steamers of 3,000 to 4,000 tons on its southern side, while on the north it is connected with an extension of the railway station, thus giving direct connection between steamer and train. Pier No. 2 was constructed parallel with Pier No. 1 to the north and has a length of 200 *ken* and a width of 21 *ken*, thus enabling it to accommodate four steamers of 7,000 to 20,000 tons at the same time, two on either side. Three railway tracks are laid on it on which light engines for haulage are employed. In addition, sheds were built for temporary storage, and the harbor was dredged at its mouth and near the pier to the depth of 24 to 36 *shaku*. This work was all completed in the fiscal year 1918 and cost Y.3,940,000.

These arrangements were all based on a maximum capacity of 700,000 tons a year, but, of late, trade through this port has increased far more rapidly than expected and reached over 1,590,000 tons in 1918, giving every sign of still further increase, so the government-general planned a second program comprising (i) enlargement of the jetty connected with Pier No. 1 to afford space for building sheds and roads on it, constructing at the same time a new quay wall 215 *ken* long and 50 *shaku* wide and making the width of the pier 56.5 *ken* ; (ii) widening Pier No. 2 to 61 *ken*, making the middle part of it a mole and the two sides mooring piers, and constructing sheds, tracks and roads on it ; (iii) construction of a breakwater at the mouth of the harbor ; and (iv) dredging of 220,000 *tsubo* of the area of the harbor to the depth of 24 to 27 *shaku* so as to obtain a more extensive anchorage, and providing mooring arrangements in the docking area at Kitahama. This program was scheduled to be accomplished in six years from the fiscal year 1919 at an estimated expenditure of Y.9,172,000.

BARON M. SAITO,
Governor-General of Chosen

(*b*) JINSEN

Jinsen, opened to foreign trade in 1883, is a port not far distant from Kejio, and occupies a position in the foreign trade of the country second only to Fuzan. On account of the difference between ebb and flow, averaging as much as 33 *skaku*, great inconvenience was experienced in mooring and unloading, so the government-general enlarged the scope of the harbor works there and decided to provide it with a lock-gate dock. In form the lock-gate is exactly similar to the Panama Canal gate. The water inside the dock has an area of 30,000 *tsubo* and a depth of 27 to 30 *shaku*. One side of it, forming a quay wall 250 *ken* long, can accommodate three steamers of 4,500 tons, while the other side is used for unloading. To shelter the harbor and make easy the entrance and exit of ships, and to give convenience to ships mooring inside the dock, it was planned to construct a jetty between the city of Jinsen and Getsubito (an island), and a training wall 790 *ken* in length running south-west of Sha-to, while sheds and tracks were also to be provided. The work was started in 1911 at an estimate of over Y.7,000,000 with the expectation of finishing it in the fiscal year 1922. The lock-gate dock, the principal part of the program was finished in October, 1918, and has since been in great use as the following table shows :—

	Ships Entering Harbor		Ships Entering Dock	
	Number	Tonnage	Number	Tonnage
1919	7,828	539,355	1,068	293,826
1920	7,820	535,396	1,296	343,203

There is now in progress investigation of the works requiring to be done for the enlargement of the harbor, improvement of the fairway, and increasing the depth of water.

(*c*) CHINNAMPO

The works here were begun as a four-year undertaking in the fiscal year 1911, and finished as planned in 1914 at a cost of over Y.830,000. The principal work was the building of a quay wall so equipped as to be able to accommodate two steamers of over 3,000 tons at the same time along its length of 140 *ken*, but the maximum difference of 24 *shaku* between ebb and flow is the source of much inconvenience in unloading, so the government-general is now making investigation of the works necessary for coping with this difficulty and for ensuring the future development of the port.

Government General Building, at Keijo

(*d*) GENZAN

The harbor works at Genzan are now under way as a seven-year undertaking from the fiscal year 1915, the estimates for them being put at Y.2,640,000. The principal work of the program was the building of a quay wall 150 *ken* long and capable of accommodating two steamers of 3,000 tons at the same time. The depth of water at the anchorage was increased by dredging from 21 to 24 *shaku*, and a breakwater 225 *ken* long was constructed at the mouth of the harbor. Minor parts of the work were the lengthening of the existing pier, the filling in of the foreshore on an area of 20,000 *tsubo*, and the building of a place 270 *ken* long for unloading. All is finished with the exception of some part of the land equipments.

Dr. R. MIDZUNO,
Former Administrative Superintendent of Chosen. Now Minister for Home Affairs in the Kato Cabinet

After these harbors the one requiring urgency in improvement in its equipment is Seishin, and investigation of the works to be done is now in progress.

Improvement in shelters for fishing vessels is also urgently needed, and to effect this the government has granted subsidies since the fiscal year 1912. To fishing ports of special importance experts are sent from the government-general to make actual investigation of the equipment necessary for the future.

Keijo Post Office

River Improvement

The large rivers in Chosen, such as the Oryoku, the Daido, the Kan, and the Rakuto, are of great service to traffic and communications. At the same time they are apt to be a source of danger to the lands on either bank every time they are in flood, since nothing has ever been done to keep them within their proper limits and the forests watered by them have been cut down regardless of resultant evils, and also a cause of great economic loss to the state.

On the establishment of the government-general, therefore, the program already in the course of execution was enlarged and made to take in the investigation of highlands and the encouragement of afforestation, and thus secure the longer retention of the water falling in the form of rain or snow, but as years must pass before the desired result can be attained and large sums of money must be expended, the immediate steps taken were the promulgation of regulations for the control, preservation, and utilization of rivers so as to prevent change in their present condition, and the starting of a close investigation of the four large rivers above mentioned and ten others, and this latter work is expected to be finished in the fiscal year 1926.

Waterworks

Owing to the geological formation of the country the drinking water is in general very hard, while the wells, being usually shallow, easily become polluted, especially in towns where the population is dense. In addition, the supply of water often runs short and thus threatens the well-being of the people. To overcome this difficulty the government-general has continuously encouraged the establishment of waterworks, so that sanitary conditions might be improved.

The only city possessed of waterworks before the annexation was Keijo. Now, not only are the prefectural municipalities and sites of provincial offices provided with waterworks but other important towns also, the

total number being 24, and not a few other towns are busy making good their deficiency in this respect.

So far as management is concerned, existing waterworks are divided into two classes, those directly maintained by the government and those by localities and public bodies. To the latter a subsidy equal to half the cost of construction is granted, and, as waterworks are essentially works of local interest and ought not to be maintained either in part or in their entirety by the state, the government-general is planning the early transfer of the former class to the prefectural municipalities concerned.

Buildings

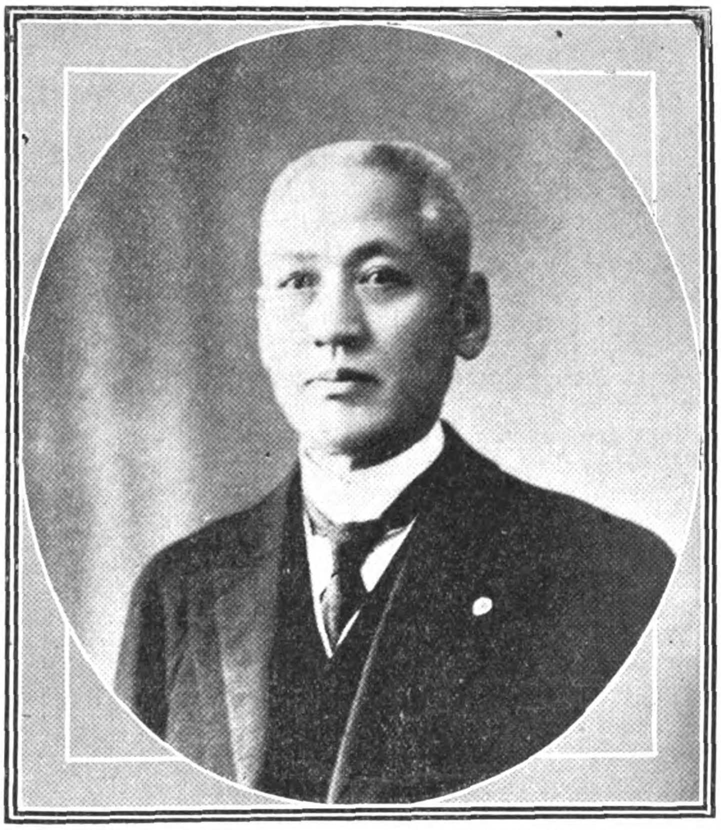
(a) Government-General Offices

The present offices of the government-general find place in the old building of the residency-general and the various additions since made, but they are not suitable as government offices either with regard to site or to equipment, so after careful investigation a site for new offices was chosen in 1912. The site selected was the front part of the grounds of Keifuku palace or north palace, and here it was planned to erect an iron-framed concrete building of five stories, including attic and basement, covering 2,115 *tsubo*, and the work was started in July, 1916, as an eight-year undertaking at an estimated expenditure of Y. 3,000,000, but the rise in price of material and labor has already added Y. 900,000 to the cost, and indications point to further increase to about Y. 3,000,000 more if the work is to be executed according to the original plans.

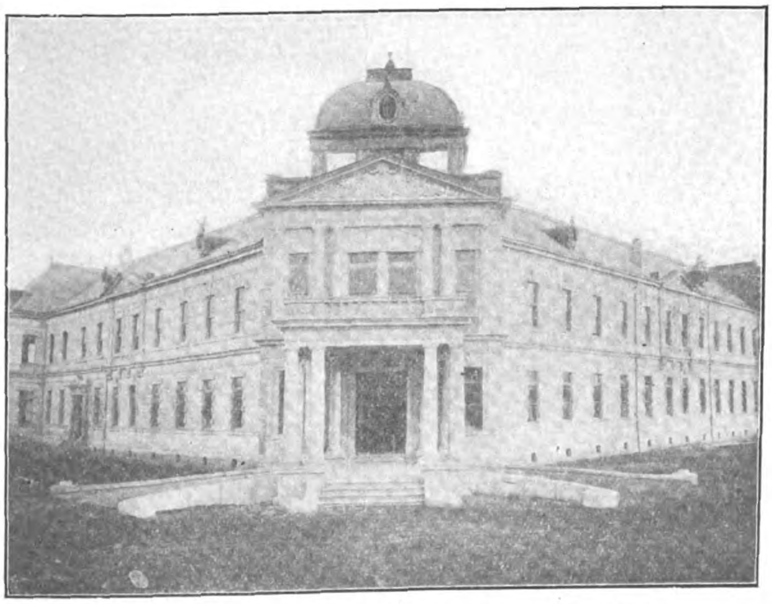
(b) Various New Buildings

Most of the public offices in Chosen are housed in old Korean buildings, which are very inconvenient for the dispatch of business, so the government-general has been spending annually Y. 2,000,000 or Y. 3,000,000 in building provincial offices, police stations, law courts, prisons, etc., and in the fiscal year 1920, on account of the introduction of a cultural policy, the building estimates were increased to Y. 9,000,000, including the Y. 700,000 annually earmarked for the building of the new government offices.

The Bank of Chosen at Keijo



Mr. S. Minobe, Governor of the Bank of Chosen



Offices of the Oriental Development Company at Seoul

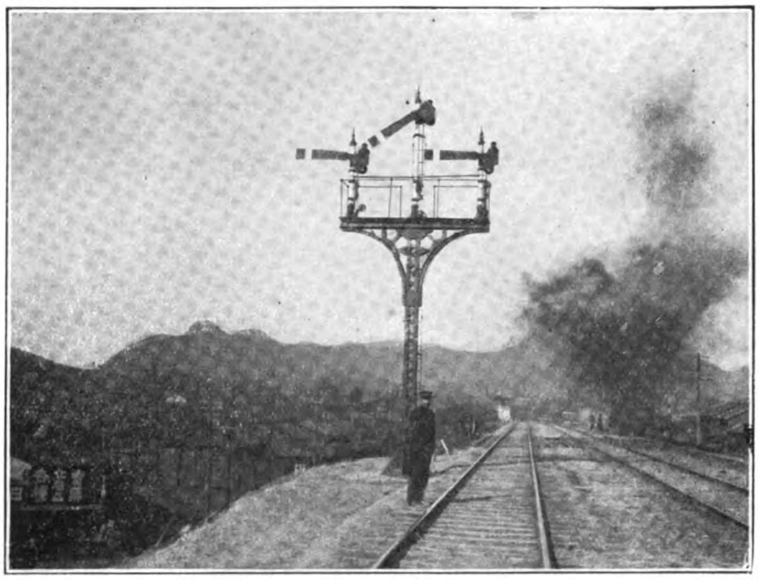
Though an extraordinary transformation has been effected in administrative affairs, no shrine for national ceremonies has yet been erected, so, by Notification No. 12 of the Cabinet in July, 1919, a site was chosen on Nanzan or South Hill, Keijo, for the erection of a government grand shrine for the veneration of Amaterasu-O-Mikami and the late Emperor Meiji at an estimated expenditure of Y. 1,500,000. Work on the Chosen shrine, as it is named, is now in progress, and the ceremony for purification of the building site was held on the 27th of May, 1920. According to the plan the site of the shrine itself and the three terraces of approach covers some 7,000 *tsubo*. The surrounding ground, about 90,000 *tsubo*, is called the Inner Garden, and there is an Outer Garden of about 110,000 *tsubo* on the eastern side of it.

Electric and Gas Undertakings

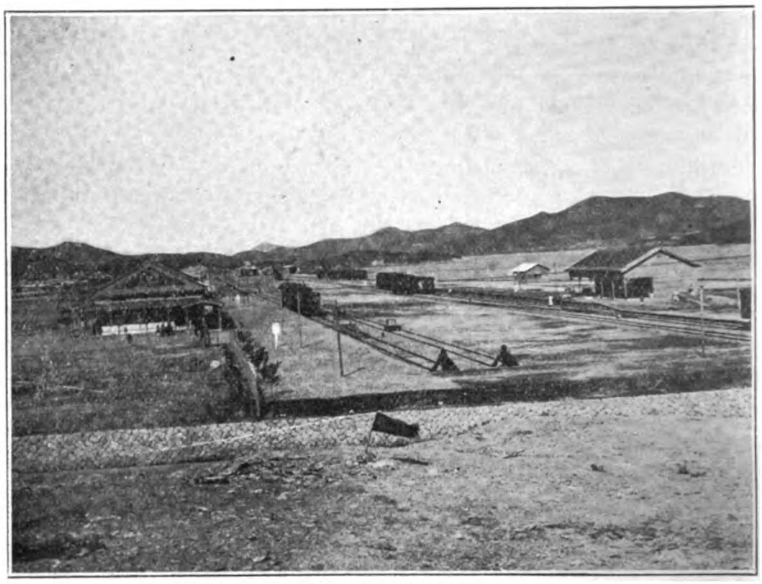
(1) Electric Undertakings

The first electric undertaking in Chosen was the building of a tramway by the Kanjo Electric Company established by an American in 1899, and in 1901 it started the supply of electricity for lighting purposes. Similar undertakings were started in Fuzan in 1902 and in Jinsen in 1906, after which no further progress was made, and at the time of annexation electric undertakings in the country numbered but three with an aggregate capital of Y. 3,300,000 and a capacity of 1,380 kilowatts.

Japanese, however, entering more and more freely into Chosen, and the population in cities becoming more and more dense, commercial and industrial undertakings came into existence one after the other, social and economic conditions improved, and the



Nandaimon Station Yard, Seonl



Moppo Station

growing tendency to use electric light and power in Japan proper exerted its influence in Chosen, and not only was the Kanjo Electric Company bought out by a Japanese company but many other electric undertakings were promoted in rapid succession.

Previous to annexation there were no regulations for the control of these undertakings, but, after the establishment of the government-general in 1910, regulations were promulgated, by virtue of which it was necessary to obtain permission of the government before starting any new electric undertaking, and recognition by the authorities of the proposed scale of charges.

Since the framing of these regulations electric undertakings have undergone a very healthy development, and the advance in the condition of the people, especially under the influence of the situation in the fiscal years 1918 and 1919, caused the demand for electric power to increase greatly, and at the end of the fiscal year 1920 there were 37 electric undertakings under way, of which 28 were actually at work, having a total capital of Y.48,950,000 of which Y. 17,710,000 was paid up, and a capacity of 35,500 kilowatts. In addition to these there were ten undertakings run by the government for its own use, and 42 private ones.

In former times almost all electric undertakings in Chosen depended upon heat for their motive power, only two or three making use of water-power, so in 1911 the government-general began to make investigation of water-power that might be utilized for generating electricity, and completed it with respect to eleven of the larger rivers, such as the Rakuto, Kan and Daido, and part of the Oryoku, in the fiscal year 1914, discovering thereby 80 sites capable of generating 76,000 h.p., of which 39 with a combined capacity of 33,900 h.p. were regarded as of easy and profitable management, and these were surveyed and work started on them, and, as the healthy development of electric undertakings requires long years and close investigation, the government-general is thinking to make of these reliable object-lessons to those intending to start similar works elsewhere.

(2) Gas Undertakings

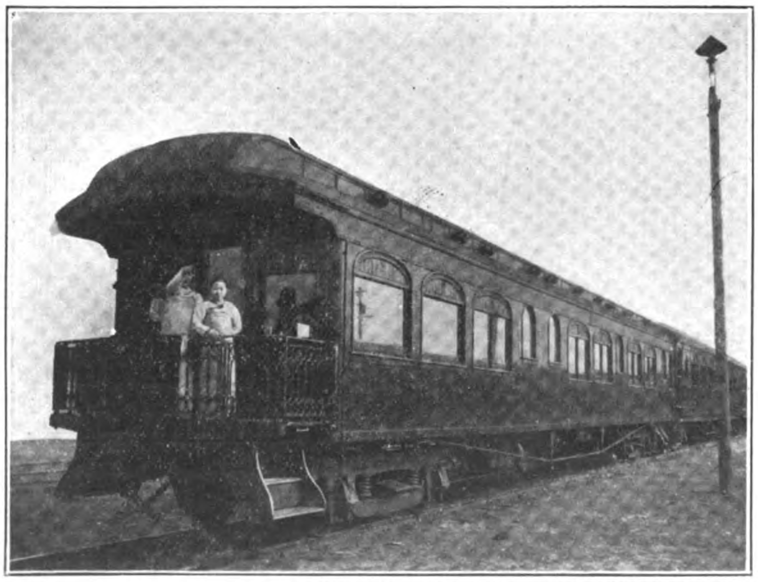
There are two gas-producing undertakings in Chosen, one at Keijo and the other at Fuzan, both being carried on as branch works by electric companies. The former started work in 1909 and the latter in 1912 on an aggregate capital of Y.2,200,000, and the gas produced by them reached 141,690,000 cubic feet in the fiscal year 1919.

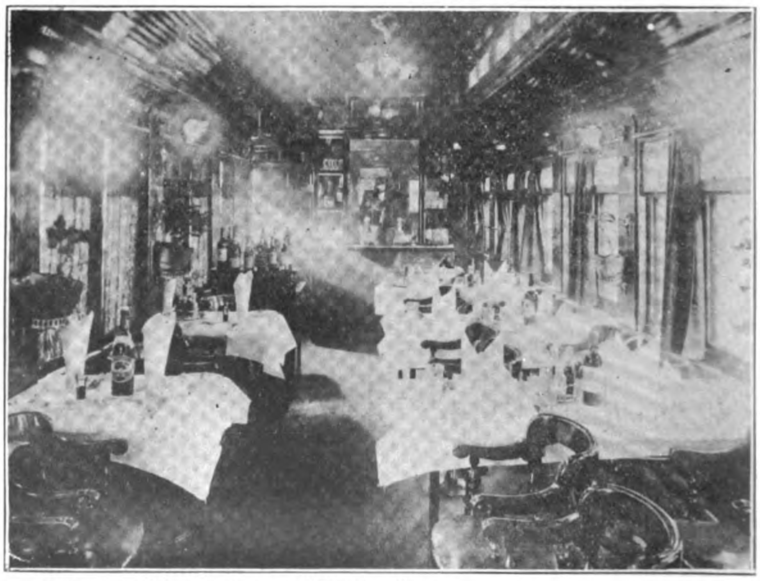
Control of gas undertakings was formerly exercised by the police authorities, but, as they are carried on by electric companies, they were put under the supervision of the communications bureau in May, 1919, in order that control of both businesses might be uniform.

Railways

(1) State-owned Railways

The first instance of a railway in Chosen was the Keijo-Jinsen line opened for general traffic in 1899 by the Kei-Jin Railway Company. In 1901 the Kei-Fu Railway Company was established

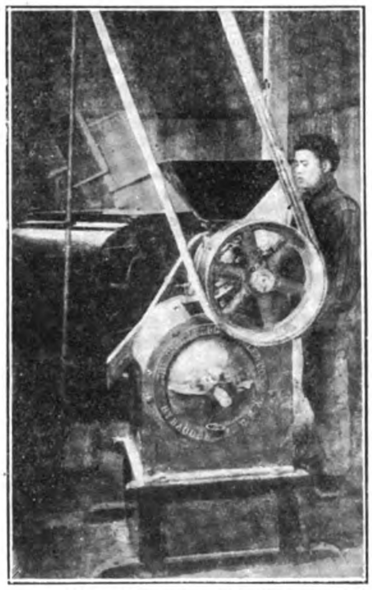




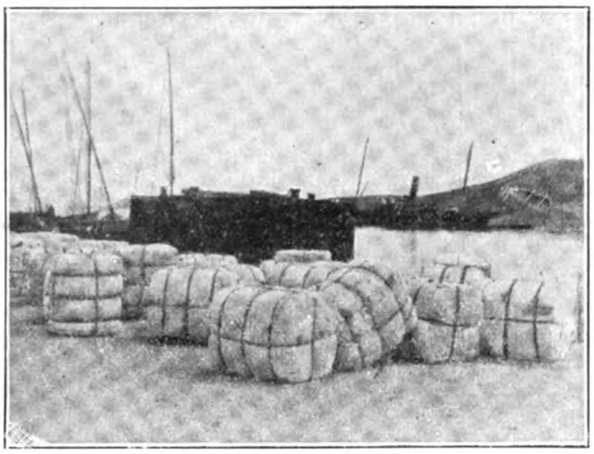
Luxurious Traveling on the S.M.R. Express through Korea; Observation and Dining Cars

and began the construction of the line between Keijo and Fuzan, and in 1903 bought the Kei-Jin line. In 1904 the line between Keijo and Fuzan was opened to traffic, and in 1905 the line between Keijo and Shingishu and the Bazan Line were completed for the use of the army during the Russo-Japanese war. In 1906 the Japanese imperial government bought out the Kei-Fu Railway Company and took over the Keijo-Shingishu and the Bazan lines from the department of war, and all were placed under the control of the railway superintendence bureau of the residency-general. In 1909 they were again made part of the Japanese government railways, but, on the government-general being established in 1910, control of them once more changed hands. During all this time improvement and construction work was steadily carried on, and the year 1910 saw the completion of the line between Heijo and Chinnampo; in 1911 the Oryoku was spanned by an iron bridge, thus connecting the railways in Chosen with the South Manchuria railway; in 1914 the line between Taiden and Moppo and that between Keijo and Genzan were completed; in 1915 part of the line between Genzan and Kwainei was opened. The last named is still in the course of construction, but traffic is already regularly conducted between Seishin and Kwainei in its northern part and between Genzan and Kanko in its southern part, and at the end of the fiscal year 1920 the total mileage of state-owned railways open to business in Chosen was 1,157 miles.

Cotton Ginning in Korea

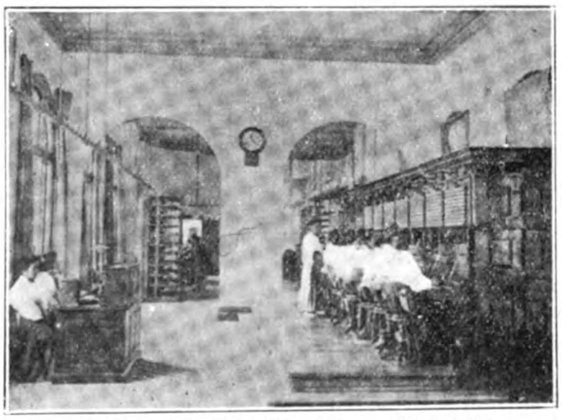


Rice Cleaning Machine



Ginned Cotton ready for Shipment

Telegraph Room at Fusan Post Office



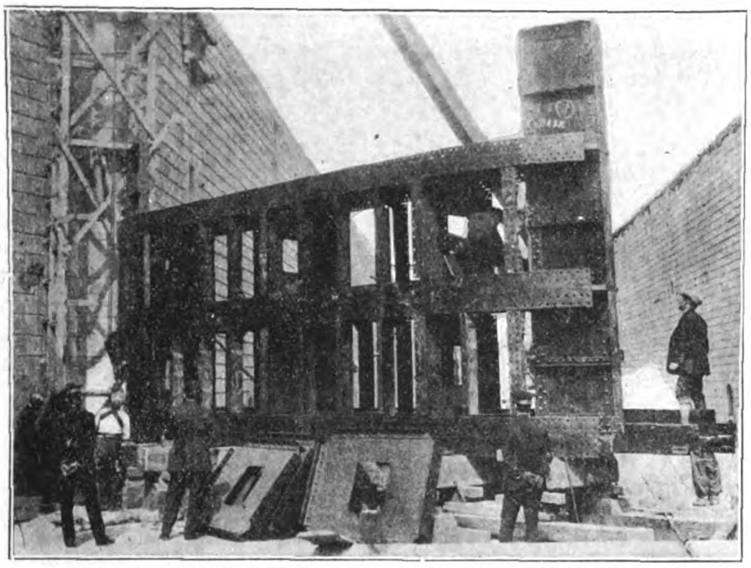
Telephone Exchange at Fusan Post Office

Single control of the railways in Chosen and Manchuria being considered advisable on account of their economic and communicative relations, the government-general, in accordance with the imperial ordinance of the 31st of July, 1917, concluded a contract with the South Manchuria Railway Company and entrusted to it the management of all the state-owned railways in Chosen no and after the 1st of August.

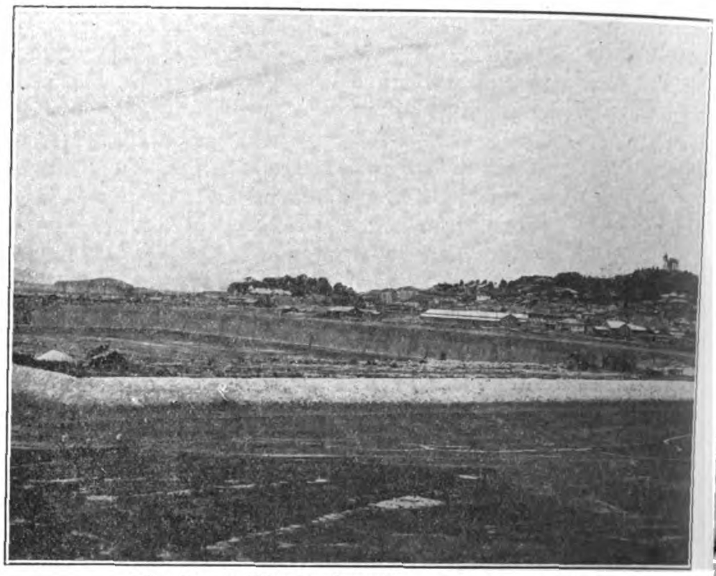
According to the contract above mentioned, the entire management of the state-owned railways in Chosen, except the formation of plans for new construction and improvement and the provision of capital for the purpose of carrying them out, was entrusted to the South Manchuria Railway Company for twenty years, on condition that the net earnings to the equivalent of 6 per cent. on the total amount of capital furnished by the government-general since the fiscal year 1911 were paid over to the government-general each year, and in the event of the profit gained falling short of that amount in any one year the deficit to be made good out of the profits of succeeding years, while should the profit exceed the amount required, half such excess was also to go to the government-general. This arrangement, however, leading to some amount of inconvenience in settling accounts, another contract was concluded between the government-general and the South Manchuria Railway Company on the 23rd of July, 1918, relieving the company from paying over the half of any excess profit obtained but requiring it to bear construction costs.

The railways in Chosen, by bridging the Oryoku and making connection thereby with the Manchuria railway and with European railways by the Chinese Eastern Railway, have become part of the international railway system, and this has resulted in direct communication between Fuzan and Mukden. To further this, the ferry-steamers between Shimonoseki and Fuzan have been made to run more frequently, and direct communication between Japan and Manchuria and between Japan and China, has been established. Though the railway business suffered for a time through the Great European War, it was not long before it regained its former activity, and even surpassed it, owing to the deficiency in bottoms, so that of late years congestion of goods at every station has been the rule owing to the development in productive industry, and this has necessitated increase in the number of locomotives and trucks, and a closer co-operation between the government railways and forwarding agents. The following table gives some idea of the railway development:—

Fiscal Year	Length	Passengers	Freight	Receipts
	Miles	*Miles*	*Tons*	*Yen*
1920	1,157.4	12,421,441	3,186,073	23,816,807
1919	1,153.2	12,184,485	3,642,829	21,635,968
1910	674.6	2,024,490	888,723	4,095,752



Lock Gates in Course of Construction for the Jinsen (Chemulpo) Harbor Works



The Jinsen Wet Dock in Course of Construction

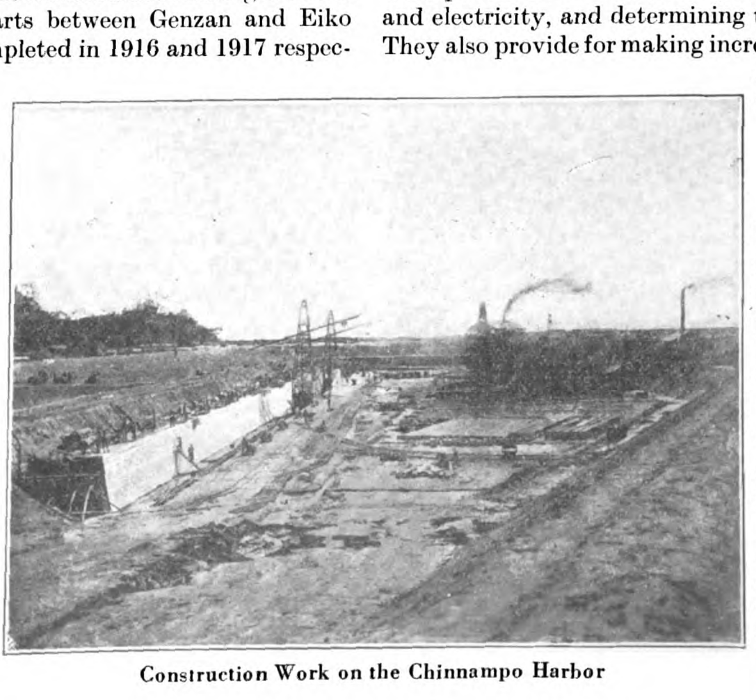
Though railway rates and charges had not been revised since 1912, the increase in expenditure owing to the rise in price of commodities at length required this to be done, but great care was taken to make them no higher than absolutely necessary.

The hotel business as an adjunct to the railway business was first started at Fuzan in 1912 for the convenience of foreign tourists by making use of the upper stories of the station there, and later on in Shingishu. In 1914 the Chosen Hotel was established on a large scale in Keijo, and a branch of it at Kongozan for the convenience of sight-seers there.

Warehouses were established in 1913 at Keizan and ten other places, and as time went on were erected in other important centres. Storage yards were also prepared to cope with the prevailing congestion, and at the present time 67 points along the railways are provided with warehouses or sheds.

As regards new construction and improvement of existing lines, the Kei-Fu line has been continually improved since the fiscal year 1914, while the new lines Taikyu-Kinsen and Taiden-Fuko were completed in the fiscal year 1916, and the Kinsen-Taiden in the fiscal year 1919, while the new line between Soryo and Fuzanchin and that near Keijo are now in the course of construction. The Kankyo line in the north-east between Genzan and Kwainei totals over 376 miles in length and has a branch line running between Yujo and Seishin. Of this the parts between Genzan and Eiko and Seishin and Kwainei were completed in 1916 and 1917 respectively, between Eiko and Kanko and Yujo and Ranan in 1919. In the west the Keijo colliery railway bought the line between Birin and Shokorai from the Onoda Cement Company and opened it to business in 1918, and the Konan line started work on a track between Taiden and Moppo and between Riri and Gunzan in 1910 and opened both to business in 1914.

Of the lines now in the course of construction or projected for future construction, the Kankyo line will be completed in the fiscal year 1926, the Chinkai line in the fiscal year 1925, the new line between Heijo and Genzan will soon be begun, and a double track between Keijo and Fuzan and between Keijo and Shingishu will be laid, and new lines between Kanko and Manpochin, Bazan and Shoteiri, Genzan, Koryo and Fuzanchin, Keijo and Koryo, and Shinanshu and Kokai, started as soon as financial conditions will allow.



Construction Work on the Chinnampo Harbor

(2) Private Railways and Tramways

For the encouragement of private railways and tramways, the government-general promulgated the Chosen light railways regulations in 1912, making provisions for their supervision and protection, and since then has annually sent officials to investigate projected private railway lines. In the fiscal year 1914 it also made provision for granting subsidies to important lines to meet any deficiency in profit below a certain percentage on the paid-up capital of the company favored.

Up to 1917 the rate was 6 per cent., and this was raised to 7 per cent. in 1918 and to 8 per cent. in September, 1919. On the reforms in the government organization being effected, new regulations relating to the subsidies to be granted them were drawn up and were promulgated at the end of the fiscal year 1920.

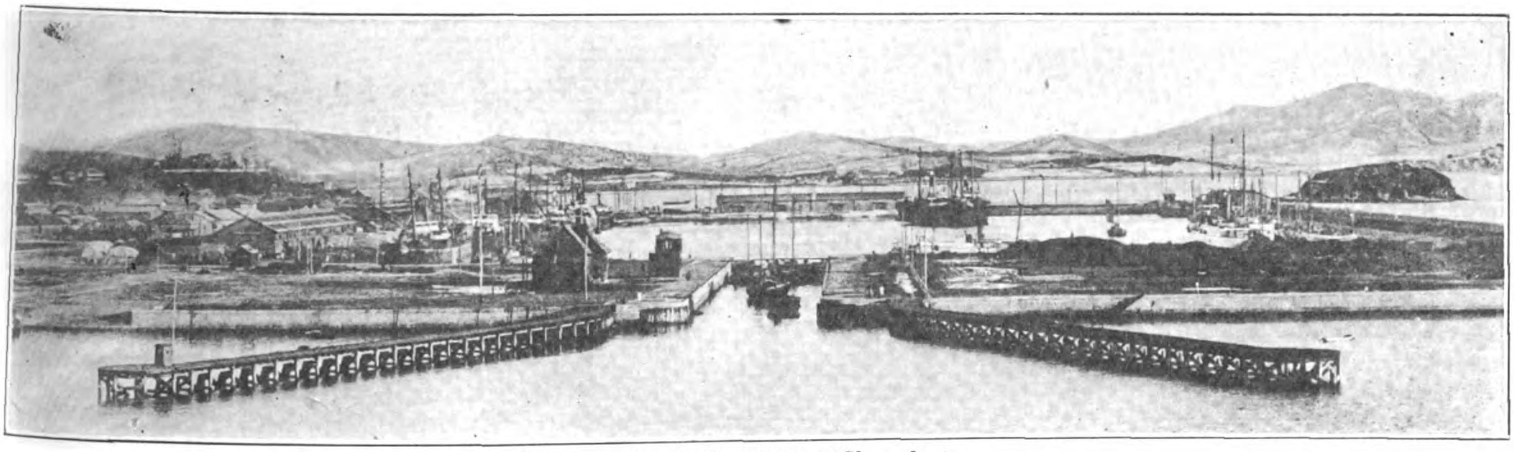
As the light railway regulations also required revision owing to the progress of the times, the Chosen private railway regulations were published in June, 1920, limiting the motive power to steam and electricity, and determining the gauge at 4-ft. 8.5-in. as a rule. They also provide for making increase in capital, floating debentures, amalgamation of companies and various other matters.

Factories

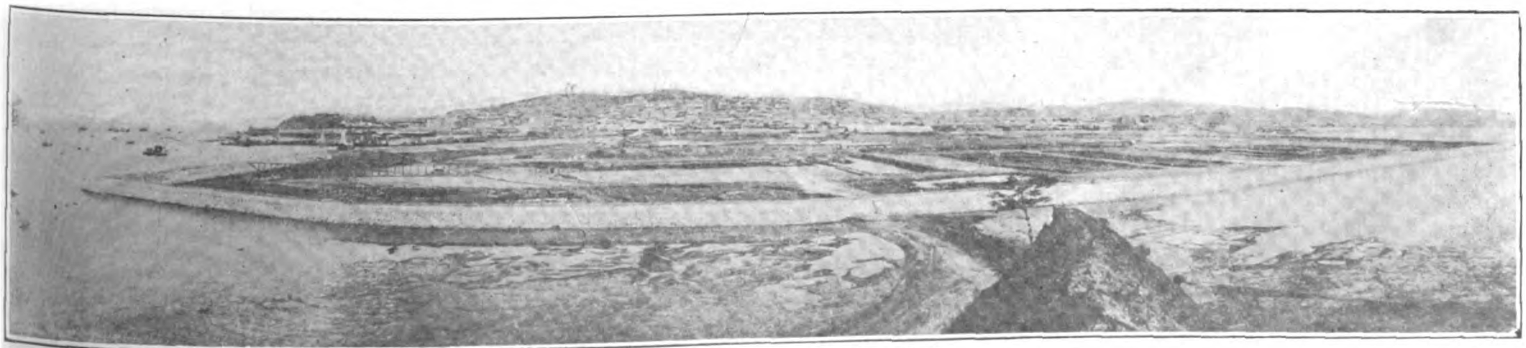
Except for some few run by Japanese and foreigners, factories on modern lines were practically non-existent in Chosen prior to the great European war, but the abnormal conditions induced by that war quickly brought about a change, and the 328 factories with an aggregate capital of Y.13,000,000 existing in 1912 increased to 1,700 in 1918, and to 1,900 in 1919 with an aggregate capital of Y. 129,000,000. In the following table are ennumerated the most important manufacturing companies established in

HARBOR CONSTRUCTION IN KOREA

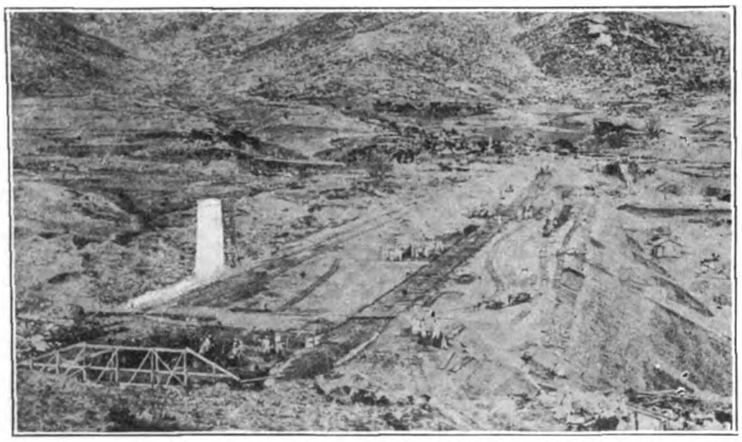
The New Pier and Railway Terminus at Fusan



The New Wet Dock at Jinsen (Chemulpo)



Construction of the Jinsen Harbor Dock



Reservoir of Chinnampo Waterworks in Course of Construction

Reservoir of Fusan Waterworks in Course of Construction

1918 and 1919 with a capital of Y.500,000 or more :—

Name of Factory	Year of Establishment	Output	Capital	Composition
			Yen	
Chosen Flour Company ...	1918	Wheat flour	1,000,000	Japanese
Chosen Oil Company ...	,,	Cotton-seed oil	500,000	,,
Chosen Starch Company ...	,,	Starch	500,000	,,
Keijo Reeling Company ...	,,	Silk-thread	500,000	Korean
Keijo Spinning Company ...	,,	Weaving and spinning	1,000,000	Korean
Onoda Cement Company ...	,,	Portland cement	1,800,000	Japanese
Chosen Raw Silk Company ...	1919	Raw silk	1,000,000	,,
Chosen Electric Industrial Company	,,	Electric power and bricks	10,000,000	,,
Asahi Brewing Company ...	,,	Refined saké and distilled spirits	1,500,000	,,
Chosen Distilled Spirit Company	,,	Distilled spirits	500,000	Japanese and Korean
Seisen Ginning Company ...	,,	Ginning cotton	1,000,000	,,
Dai Nippon Sugar Company	,,	Cane-sugar and beet-sugar	20,500,000	Japanese
Mansen Dye-stuff Company	,,	Maple-leaf extract	1,000,000	,,
Chosen Fertilizer Company ...	,,	Bean cake and bean oil	3,000,000	Japanese and Korean

(3) Lumber Undertaking Station

The Lumber undertaking station is the special government office controlling the state forests covering about 2,200,000 *chobu* in the basins of the Oryoku and Toman, and engages in various kinds of work tending not only to improve the forests themselves but to improve their indirect utilization.

The principal trees in the forests are mostly those found in the frigid zone, such as the larch (larix davurica var. principis-ruprechtii), fir (picea jezoensis and abies holophylla), birch (betula schmidtii), and aspen (populus tremula and populus suaveoleus), all valuable for utilitarian purposes.

The investigation of the forests, undertaken as a ten-year consecutive work from the fiscal year 1913, consists of two kinds, that is, investigation of the boundaries of the state forests under the control of the station, and investigation regarding their afforestation, and of the former 1,780,000 *chobu* and of the latter over 910,000 *chobu* had been worked over by March, 1910.

As for afforestation, not only is the natural way utilized but plantation on a large scale is carried on, seedlings of the most suitable varieties for this region being raised in special nurseries.

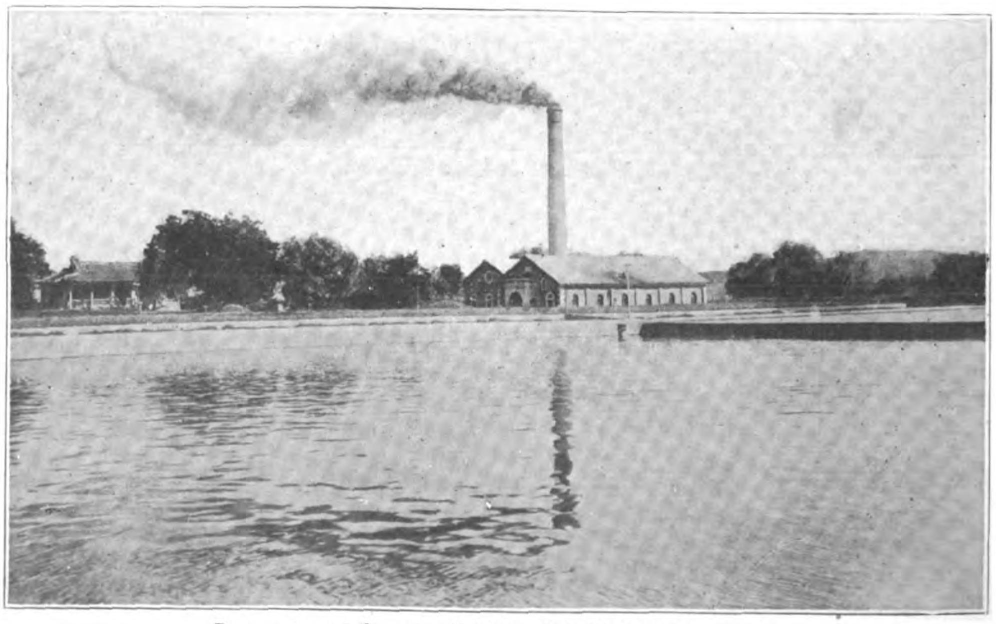
For the proper protection of the forests the station has established branches to guard against wilful damage being done to them, and since the fiscal year 1915 protection unions have been organized in that region to the advantage of both officials and people, and these numbered 255 in March, 1920, guarding an area of over 610,000 *chobu*. As they are not yet thought sufficiently numerous for the purpose, it is proposed to encourage the organization of 60 more such unions.

Felling and logging form part of the work done by the station, but private individuals also engage in it. These have standing trees sold to them by the government, and the logs made by them are transported to suitable points on the rivers and there rafted and floated down the Oryoku and the Toman to Shingishu and Kwainei respectively.

The following table shows how logging has been carried on for the past three years :—

	Logs Cut	Logs Arriving at Station
	Cubic shaku	*Cubic shaku*
1918	3,396,000	3,840,000
1919	3,888,000	3,480,000
1920	2,796,000	3,240,000

Preparing timber was first done by private mills under contract, but as this proved unsatisfactory to the contractors and was uneconomical to the station, a saw-mill was bought by the station in Shingishu, the seat of the station itself, in 1909 and enlarged, and was found of great assistance in keeping a happy mean between the supply and demand of timber in Chosen.



Reservoir and Pumping Station of the Keijo Waterworks

Timber prepared by the station finds its market mostly in Chosen, but a small demand for piles and sleepers comes from Manchuria. Even in Chosen it was at first prepared only for the use of government offices, but of late years it has become recognized as of ex-

cellent quality and, the credit system being introduced, the demand increased so much, especially on account of the boom induced by the great war, that the station began to find it impossible to meet it, but in 1920 the demand waned somewhat owing to the depression in economic circles.

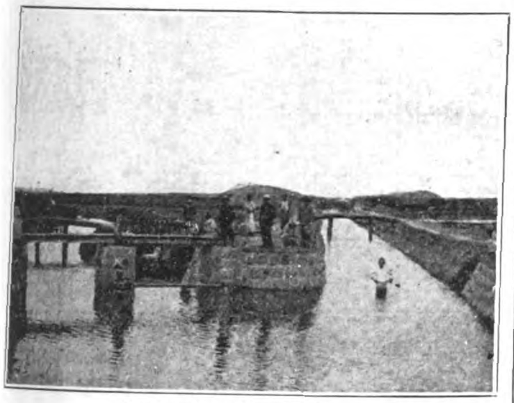
The following table gives the quantity of prepared timber and the receipts from connected sales:—

	Quantity of Timber	Receipts from Sales
	Cubic shaku	*Yen*
1918	1,884,000	2,251,000
1919	1,956,000	2,935,000
1920	1,548,000	2,623,000

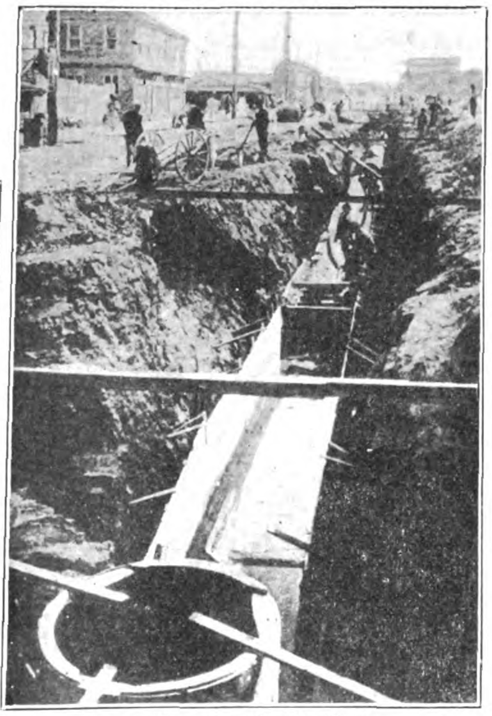
This undertaking was originally jointly financed by the Japanese and the Korean governments under the management of the resident-general. After the annexation the government-general took it into its own hands and made great improvement in its efficiency, and in the fiscal year 1918 secured from it a profit of Y. 940,000 a really amazing increase compared with the Y. 80,000 in the fiscal year 1910.

(4) Heijo Coal Mine Station

The Heijo coal mine station is actually engaging in the mining of anthracite coal in Jido and Kozanbo in Daido district, Heian-Nan-do, the coal-beds covering about 124 square *ri*. As there is not as yet a very general demand from the people for such coal, it is mostly disposed of to the naval briquette factory at Tokuyama in Yamaguchi prefecture, Japan proper, the



Irrigation Canal, Korea



Sewer Construction in Keijo

rest being sold to the public in the form of briquettes. As the coal-fields cover so large an area, there has recently been granted mining rights over some part of it to various mining companies, and the actual area retained by the station itself has been reduced to 47,000,000 *tsubo*, the amount of coal that can be safely mined being estimated at 66,000,000 tons. The coal mined by the station is almost all dust, containing over 8 per cent. of volatile matter and over 82 per cent. of fixed carbon, its calorific intensity being rated at 8,000 calories.

The undertaking was begun in 1902 and was taken over by the government-general in 1910, and between 1909 and 1911 the equipments in the mining districts at Kobozan and Jido were enlarged, and, on the demand for dust and briquettes increasing, extension works were begun in part of Kobozan and in Ritsuri and Butsudori in July, 1917, and being completed in March, 1920, it is estimated that the annual production of coal at full working capacity is 300,000 tons, as against a former output of some 100,000 tons.

The station has also a briquette factory at Jido with a capacity of 100 tons a day. The manufacturing of briquettes by the government was started in 1911, and two kinds of briquettes of small size are turned out by it for use in stoves and fireplaces, and *ondols* and kitchens, and the demand for them is increasing year by year. It is now planned to turn out a large size for use on the railways.

The annual production of coal by the station was at first not more than 40,000 to 50,000 tons, but the demand by the navy increasing, it rose to about 120,000 tons, and on Japan joining the allies in the great European war rose to as much as 150,000 to 180,000 tons, but this decreased somewhat when the war came to an end. The annual production of briquettes was at first not more than 5,000 to 6,000 tons, but as recognition of their convenience in use became more general this too increased and is now over 20,000 tons.

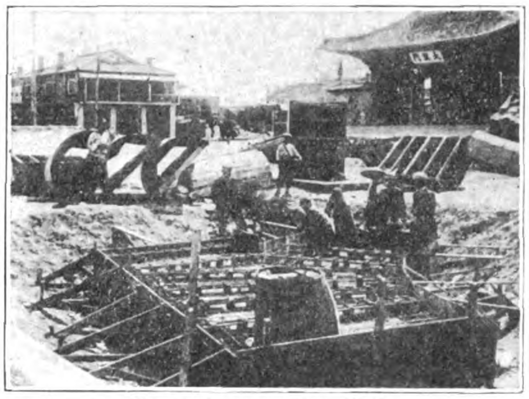
The following table shows the production and receipts from it for the last three years:—

	Output	Briquettes	Total Receipts	Net Profits
	Tons	*Tons*	*Yen*	*Yen*
1918	140,773	20,043	1,015,898	162,334
1919	128,274	24,187	1,599,241	167,063
1920	140,250	15,542	2,982,380	299,773

The coal-fields belonging to the station have been thoroughly investigated by various methods since the beginning of the undertaking, and similar work since carried on relates to the whereabouts of rocks and of seams lying deep in the ground.

(3)) Agricultural Water-utilization

As for water-utilization in Chosen, thanks to the regulations relating to water-



Sewer Construction, Keijo

utilization associations promulgated during the protectorate *régime*, and the protection and control of private irrigation undertakings since the establishment of the government-general, dependence upon rain-water, which was all but general before the annexation, waned so much that at the end of the fiscal year 1918 twenty per cent. of the total area of 1,544,000 *chobu* of paddy-fields, or about 328,000 *chobu*, was provided with irrigation arrangements, of which 289,000 *chobu* were irrigated by ponds and dams, 31,000 *chobu* by water-utilization associations, and 7,000 *chobu* by private works. The remaining 80 per cent. depends entirely upon rain-water, and produces only 1 *koku* per *tanbu* even in a most successful year, such as 1918 was, that is, only half the yield obtained in Japan proper, so the encouragement of water-utilization associations is being vigorously pursued.

The irrigation ponds and dams existing in former times numbered over 6,000 and 20,000 respectively, but so consistently had they been neglected that they were all but worthless, so subsidies were given from 1909 to 1918 to encourage their repair and maintenance in good order, with the result that 1,527 ponds and 410 dams have been rendered serviceable once more. Since the fiscal year 1919 the policy of making the local revenues bear the burden of restoring them has been pursued.

In 1920 the government-general drew up a program to be executed in 15 years from that year, and is now actually at work on it. This program aims at the improvement of one-half of the total area of uncultivated lands amounting to 800,000 *chobu*, as well as of paddy-fields and lands capable of being turned into paddy-fields.

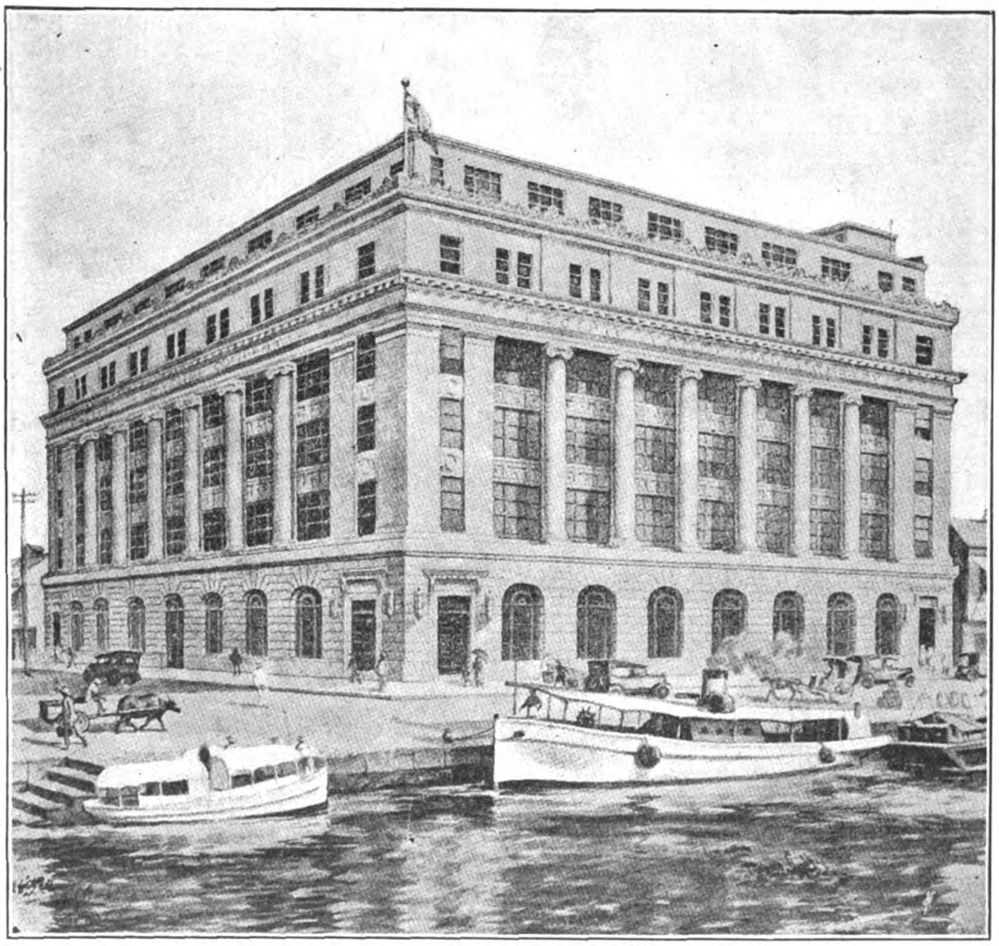
Undertakings for irrigation appeal to the common interest of agriculturists and visibly illustrate the convenience afforded by water-utilization associations, so the government-general is encouraging their formation, while it also recognizes private undertakings. Since undertakings of this kind affect people in various ways, however, the government-general has made it a rule that permission for such must first be obtained, and the number of permissions already granted is 74, affecting an area of over 8,200 *chobu*.

The New Pacific Building, Manila

THE new Pacific building at Manila is the property of the Pacific Building Company, the principal stockholders of which are the International Banking Corporation and the Pacific Commercial Company.

Occupying about 1,800 square metres of irregularly-shaped ground, it has a frontage of 140-ft. on calle General Luna and 150-ft. on Muelle de la Industria, along the Pasig river. With its five-story frontages relieved by majestic columns and the artistic details of the design standing out prominently, the building is a fine sight from any part of the Pasig river section.

In many respects the building is a model of modern building practice. Many features that have hitherto been unknown in Manila are incorporated in it. Take for instance the plastering on the walls. It had never been done before. There was no argument against it but that. The interior walls of the building are finished in fine, smooth, white plaster, just like in the United States. A prominent feature of the interior is the ceiling of the lower floor, which is to house the Bank. It is made of moulded plaster of Paris, manufactured right on the ground. The material had never before been employed for this purpose there and it was difficult at first to teach the workmen to make the moulds and attach the casts.



The New Pacific Building at Manila. Murphy, McGill and Hamlin, Architects

Light and air have been assured for all office space by the careful distribution of area and court spaces. The P. C. C. premises on the fourth and fifth floors are all open, undivided by partitions. One large room is being made into a sample room. It has glass sides and will afford a good display of goods at all times in natural light. To provide for dark, rainy days, an invisible lighting system is installed throughout. One of the most noteworthy features of the building is its sanitary and thoroughly equipped wash rooms and toilets. The plumbing throughout the building is open and easily accessible. Mail chutes are on hand on each floor.

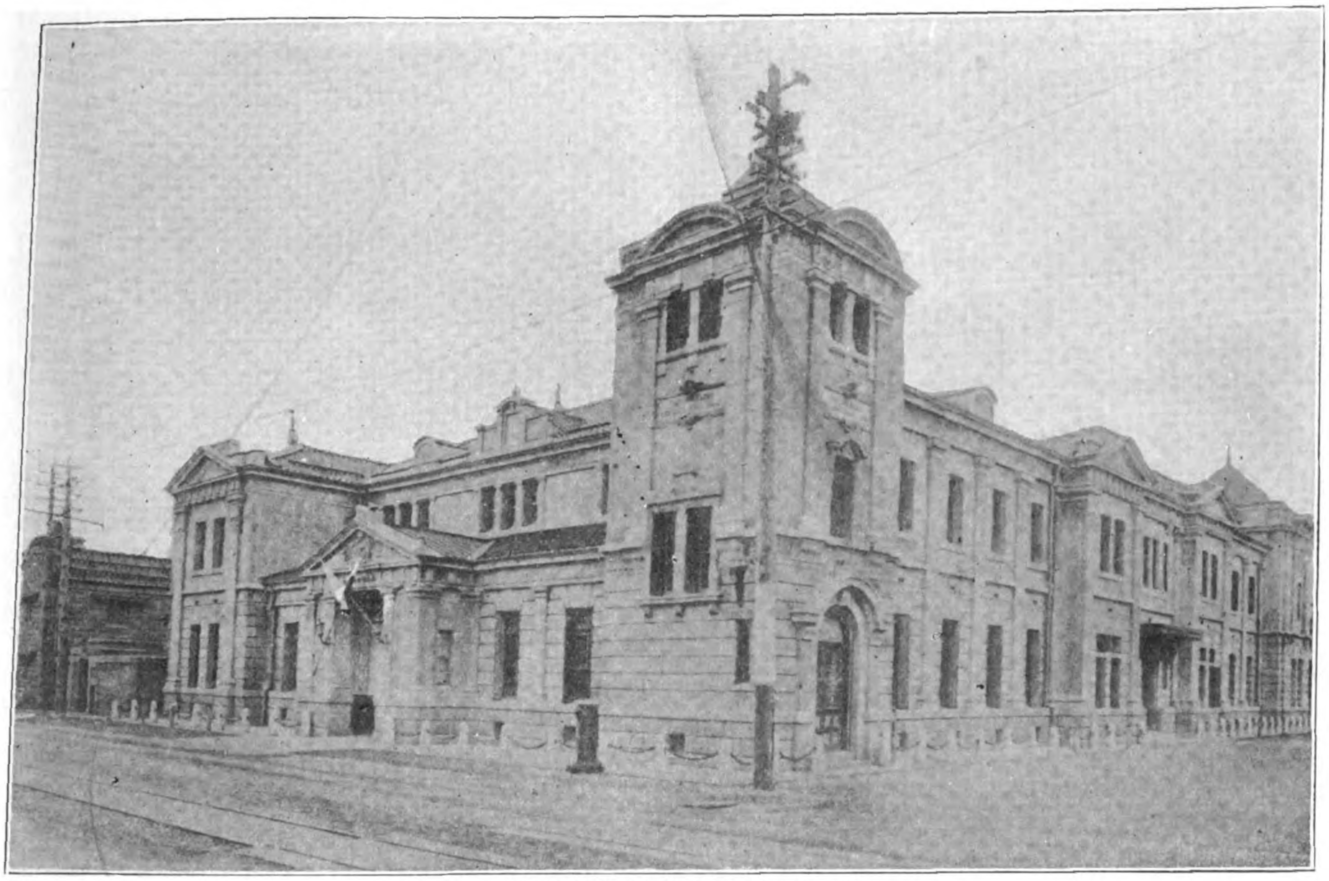
On the ground floor of the building is a pumping plant worked by compressed air which will carry the city water to the fifth and sixth floors, as the gravity system often does not reach beyond the fourth floor. This pumping installation can be used for the lower floors if needed.

Six elevators are provided for, but only four of most modern type have been installed. They are equipped with automatic safety doors, handsomely finished in bronze, which make it impossible to operate the cars until the doors are closed. This system is sure to prevent accidents. Two large shafts are used for freight hoists, consisting of blocks and tackle capable of lifting a ton at a time.

A special type of window sash has been installed throughout the building, eliminating much wooden construction and affording perfect ventilation and protection against the elements. All doors are of heavy native hardwood, brilliantly polished. The office of the general manager is entirely panelled in the best variety of Philippine hardwood. On the floors are laid thick battleship linoleum. A composition called durostone will be used to finish the ground floor walls. Marble is employed throughout the building for thresholds and ornamental slabs.

The International Banking Corporation quarters will be particularly handsome in finish and equipment, no expense having been spared in this respect. When completed, the Bank's premises will stand comparison with the finest at home or abroad.

Murphy, McGill and Hamlin, of New York and Shanghai, are the architects. They are represented on the ground by H. H. Keys. Oscar F. Campbell is the contractor and S. D. Rowlands, the structural engineer. The cost of the building alone, without the land, is P.2,000,000.



Head Office of the Hokkaido Colonial Bank at Sapporo

Industry in the Hokkaido

THE 1921 report on industrial conditions in the Hokkaido show that the total value of all products that year amounted to more than Y.150,000,000. In 1914 their value was only Y.28,700,000. The increase in value of industrial products is far greater than the increase in the value of agricultural products for which the Hokkaido is principally noted. The great industrial progress is due to the plentiful supply of raw materials from land and sea, combined with a cheap and plentiful supply of coal.

The principal industry in the Hokkaido is the manufacture of foreign and Japanese paper. The leading foreign paper mills are the Ikeda Mill of the Oji Paper Manufacturing Co., and the Ebetsu, Kanayama and Kushiro mills of the Fuji Paper Mill Co. The principal manufacturers of Japanese papers are the Kita Nihon Paper Manufacturing Co., Ltd., the Hokkai Paper Manufacturing Co., Ltd., and the Hakodate Paper Manufacturing Co., a limited partnership. The Oji and Fuji companies produce principally newsprint, supplying more than 85 per cent. of the total demand in all Japan. Their last year's production amounted to more than 200,000,000 pounds, valued at about Y.20,000,000.

The production of the Japanese paper manufacturers does not fill the demand for such paper in the Hokkaido alone. What they do not supply is imported from the northern prefectures of Japan proper. The great progress in the manufacture of foreign paper and pulp in the Hokkaido is due to the great supplies of timber and coal, and abundant hydro-electric power.

Next to paper in order of importance come fertilizers, sugar, oak bark tanning, fish and vegetable oils.

Superphosphates are manufactured in the Hokkaido and ammonium sulphate is produced from atmospheric nitrogen. Superphosphates are manufactured by the Dai Nihon Jinzo Hiryo K.K. (Dai Nihon Artificial Fertilizer Co., Ltd.), Hakodate Factory, and the ammonium sulphate is produced at the Tomakomai factory of the Denki Kagaku Kogyo K.K.. (Electro-Chemical Industrial Co., Ltd.) The total production of fertilizers in 1921 was 1,500,000 *kwan* (8.28-lb.), valued at Y.4,000,000. Before the war at the end of 1914, only half of this amount of fertilizer was manufactured, valued at less than Y.800,000.

Beet Sugar Industry

Many years ago beet sugar raising was begun in the Hokkaido, but it proved unsuccessful. In 1919, however, two companies were organized to plant sugar beets and extract sugar. The Hokkaido Beet Sugar Co., Ltd., capitalized at Y.10,000,000 has a factory at Obihiro, and the Nihon Beet Sugar Manufacturing Co., Ltd., owns a factory at Shimuzu, but because of financial difficulties business has not been very prosperous these past two years, but with the revival of good conditions an increasing acreage is being planted to beets every year. The future of this industry is very promising.

Oak Bark Tanning

The Nihon Hikaku K.K. (Nihon Leather Co., Ltd.) has a tanning factory at Ikeda, and the Nitta Obikawa Seizosho (Nitta Leather Belt Manufacturing Co.) operates one at Tokachi. There is a plentiful supply of oak bark in the Hokkaido, and the industry is not an unpromising one despite present difficulties, caused by over-extension during the war.

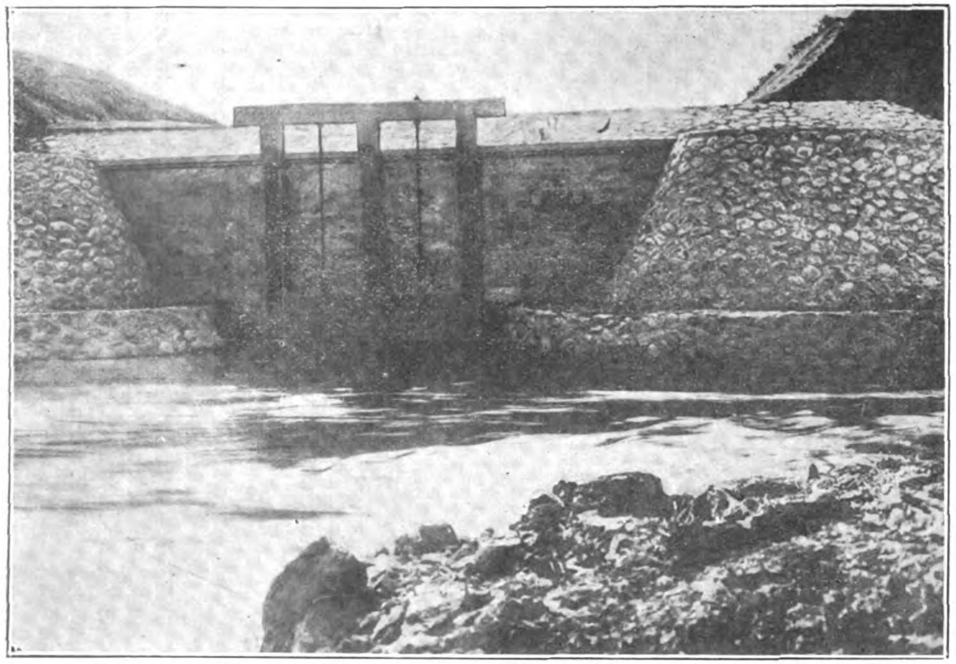
Fish Oil Manufacture

The principal oils pressed in the Hokkaido are codfish, cod liver, whale, and rape seed oil.

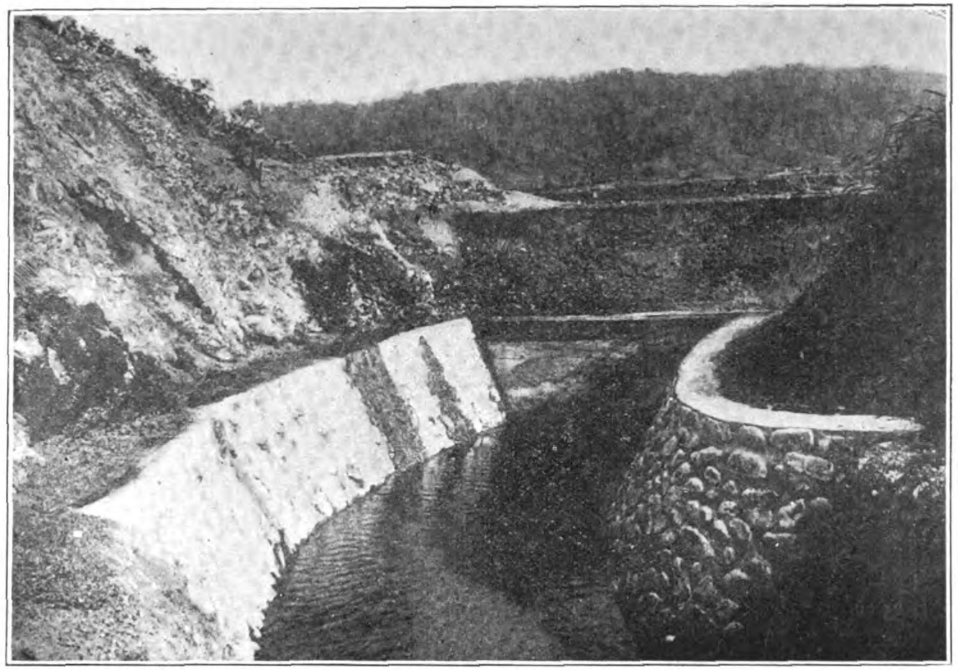
The larger part of the oil extracted is shipped to Japan in its crude state for refining. In 1914, the production of fish oil was valued at Y. 370,000. It had not increased to any great extent by the end of 1920, when it was worth only Y.380,000. The output of whale oil in 1914 was valued at Y.110,000, but in 1920 it had fallen to only Y.45,000.

HOW JAPAN IS DEVELOPING THE HOKKAIDO

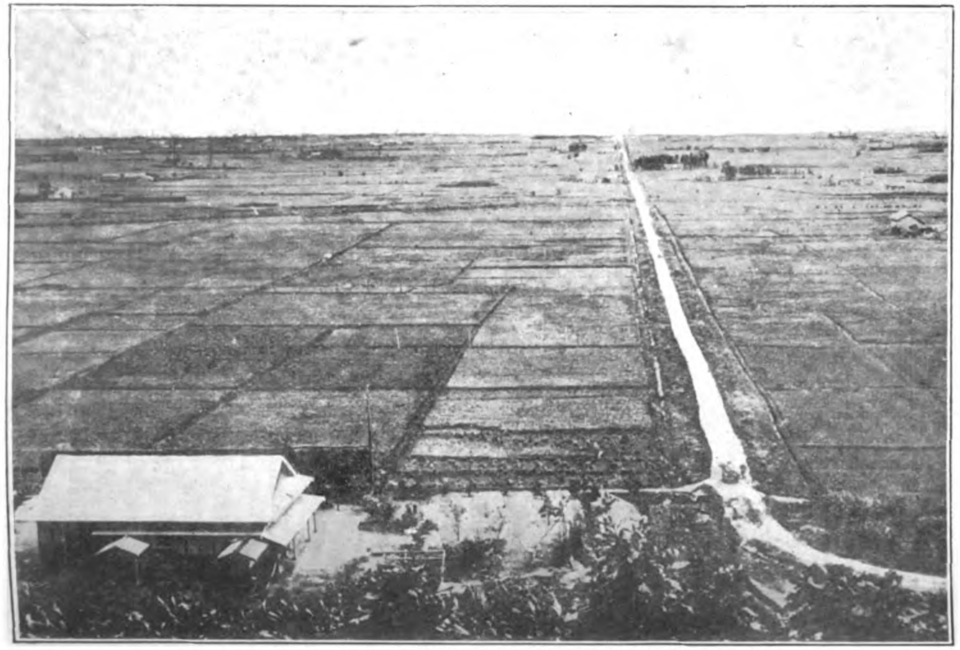
VIEWS OF THE IRRIGATION SYSTEM



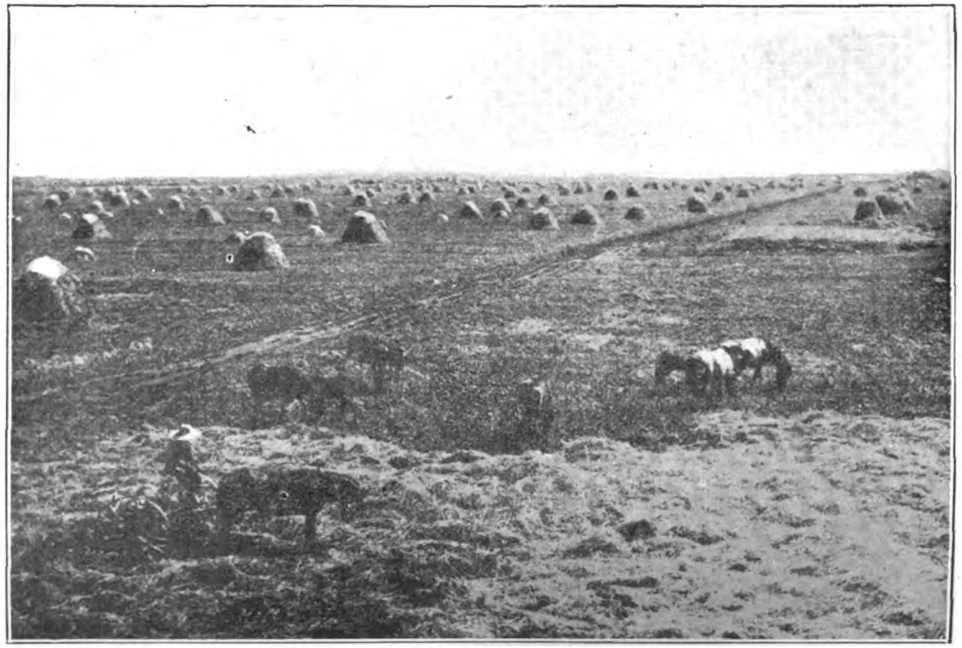
Sluice Gate of the Hokuryu Doko Guild at Hokuryu Mura, Ishikari Prefecture



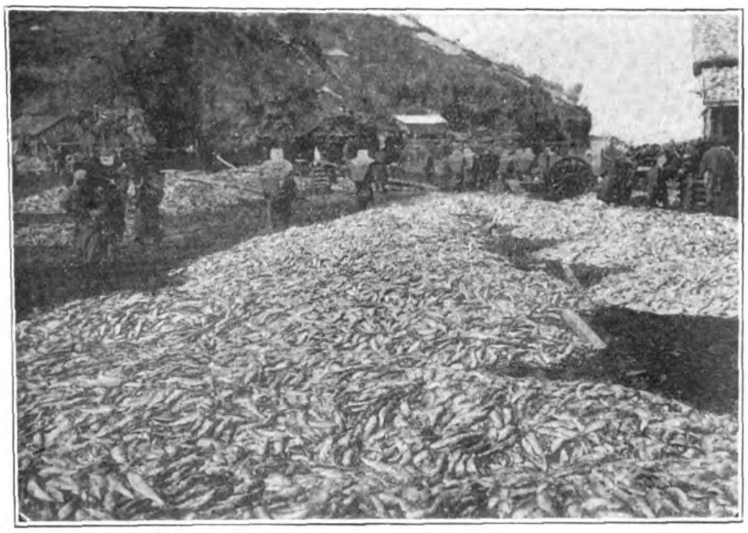
Irrigating Canal of the Hokuryu Guild



Irrigated Farm Land in Magayama-Mura, Ishikari Prefecture



The Crop from an Irrigated Alfalfa Field, near Sapporo



HOKKAIDO IS THE CENTRE OF A GREAT FISHING INDUSTRY

The Herring Catch at Yoichi, Shiribeshi Prefecture

Catch of Herrings at Oshoro, Shiribeshi, Prefecture

The Hokkaido has an extensive coast line, 1,355 nautical miles, and the supplies of fish along its sea-coast are almost inexhaustible. The reason the industry has made but little advance in these past eight years is because it is not carried on in a large way. There is a great future for a company organized to press oil on a large scale with modern machinery.

Besides these industries, there are cement, brick, glass, earthenware, pottery, shipbuilding, iron works, and other enterprises in the Hokkaido. Hemp spinning and rope manufacture has increased, and the breweries, flour mills and canning companies are making favorable progress. Industry in the Hokkaido is prosperous because its products are supplied principally to the local markets, where the demand is greater than the local manufactures can supply. There is much room for expansion of industry, especially as the resources of the Hokkaido have hardly been scratched.

Marine Transportation

Marine communication from port to port in the Hokkaido and between the Hokkaido and the main island of Japan is carried on by the Kurabayashi Shosen K.K., the Kita Nihon Kisen K.K. and the Nippon Yusen Kaisha. Since the domestic and foreign departments of the N.Y.K. have become independent of one another, great attention has been paid to the development of periodical services in the coasting trade, especially in the Hokkaido. The N.Y.K. operates the following lines to the Hokkaido and north :—

Hakodate to Karafuto, in summer only	88	trips a season.
Otaru to Karafuto, in winter only ..	20	,, ,,
Hakodate-Abashiri-Kurile Islands ..	76	,, ,,
Kobe-Kushiro	18	,, ,,
Yokohama-Karafuto	14	,, ,,

Twelve of company's fleet are operated on these routes, in addition to several chartered vessels of 1,500 to 3,200 tons.

A new passenger steamer was recently built for the company, called the *Chitose Maru* of 2,670 tons. It is furnished with wireless and ice breakers. Special attention has been paid to accommodation for third-class passengers.

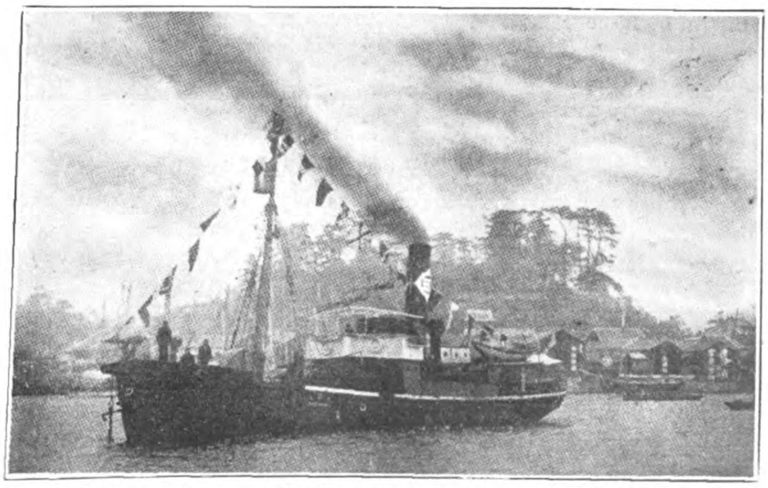
Until a few years ago steamers in the Hokkaido service were of less than 1,000 tons, but the growing business induced the N.Y.K. to build and operate a better type of vessel. The future of this transportation is very promising.

Kamchatka is not only a very profitable field of business for the canning industry, but lumber, petroleum and gold are expected to add to the wealth of this region. Lack of proper communication has kept Japanese capital from developing these resources, but with the extension of regular steamship services during the summer season, Kamchatka is expected to develop rapidly.

The Kuribayashi Commercial Steamship Co., Ltd., operating about 140,000 tons of vessels, with Muroran as the centre of its activities, engages in regular or occasional services to Saghalien, Nikolaevsk, Vladivostok, North and South China ports, the Yangtze river and Chosen. The company was established in April, 1919, taking over the shipping department of the Kuribayashi Gomei Kaisha. It is capitalized at Y.2,000,000, all paid up. Its main office is No. 1 Minami Nabe Cho, Kyobashi Ku, Tokyo, with branches at Muroran, Kushiro, Hakodate, Otaru, Yokohama, Osaka, Moji, Tsingtau and Shanghai. The fleet owned by this company consists of 11 steamships, aggregating 25,568 tons.

Besides these steamers it operates the *Hidaka Maru*, of 5,500 tons, chartered from the government. In September, 1919, this company had under charter 72 vessels of more than 148,200 tons. In March, 1920, it had only 48 vessels, tonnage 80,830. In May, 1921 only 25 vessels were chartered with a total tonnage of 52,000. But in June 1922, there was an increase in the number of vessels to 42, and in tonnage to 110,400 tons. The chartered vessels are used in freight transportation only. At present this company is operating 54 vessels of 142,400 tons.

The principal cargo is fish. With the opening of the fishing grounds in Kamchatka, the Kuribayashi Shosen Co. engages in the transportation of materials for the canneries, and the canned fish back to Japan and to China, from the early spring to the closing of the ice pack. About 70 per cent. of the total freight traffic of this company is carried in connection with the operations of the fishing companies in Kamchatka. During the fishing season the tonnage operated rises to more than 150,000 tons. The irregular services of this company cover practically the entire Far East. Its greatest endeavors are made to increase the shipment of marine products, and lumber to the Chinese markets from the Hokkaido.



A Steam Whaler of the Toyo Hogei Company operating in Hokkaido Waters

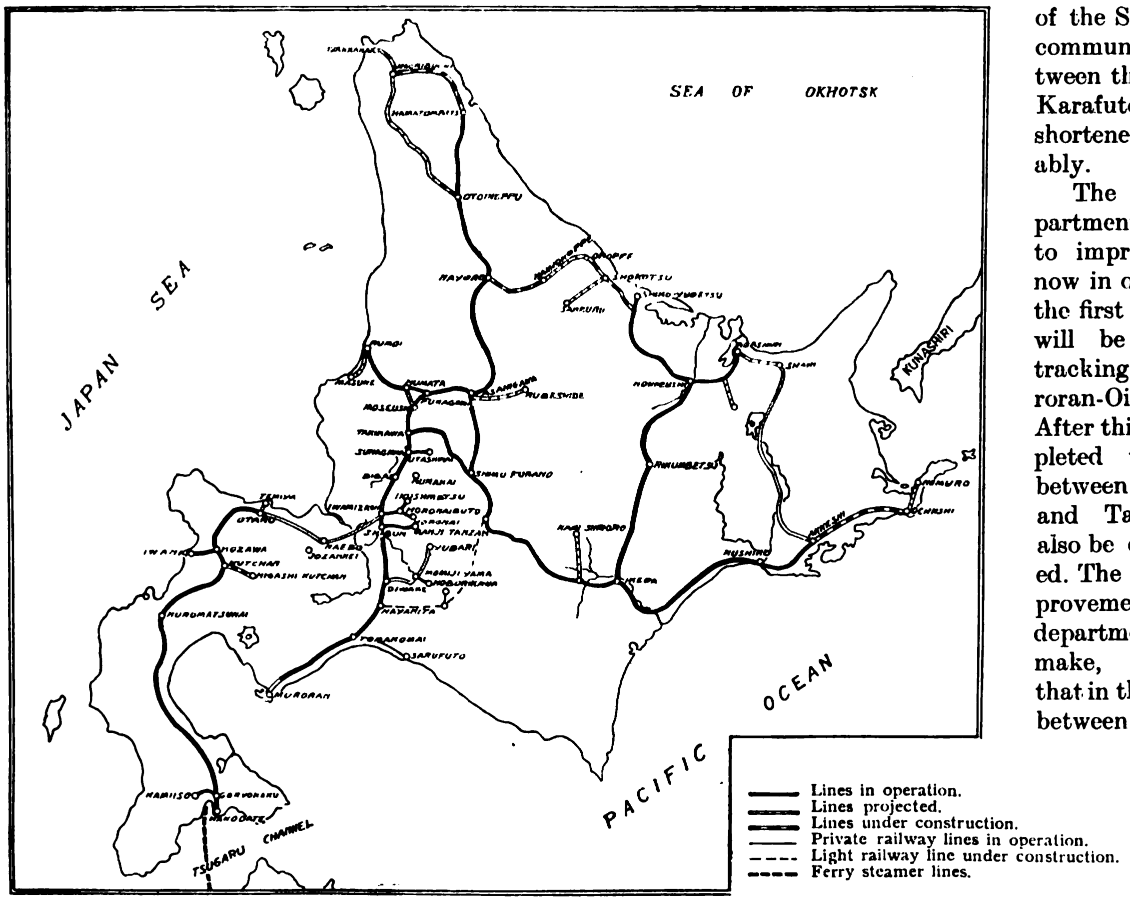
Railways in the Hokkaido

HOKKAIDO, the northern most island of the Japanese main group, is the principal undeveloped agricultural district belonging to the nation. Development, despite rapid progress, has been handicapped by lack of means of communication. Roads are still primitive and insufficient for a growing community and the rivers can be used only for the transportation of timber rafts, the principal wealth of Hokkaido to-day.

The leading products of the Hokkaido, timber and coal, are of such a nature that their successful development depends largely upon railway communication. Because of the lack of organs of communication the inhabitants of the Hokkaido are still obliged to obtain the greater part of their rice and salt from Japan proper, selling in exchange their crops of miscellaneous cereals. Consequently, the shifting of cargo has become greater and greater every year necessitating the extension of existing railway lines and showing very plainly the need of new ones.

Conditions of communication being such as they are colonists are unwilling to settle in remote places and the agricultural and industrial development in general is retarded more and more every year.

In the past whenever it was announced that any particular part of the Hokkaido would be tapped by a railway line the price of land, and land for agricultural purposes, forests and mountainous districts even, would rise by leaps and bounds, as settlers have always been attracted where there is easy means of communication.



The needs of the Hokkaido have long been recognized and compared with other parts of Japan a rapid rise in progress in the construction of railways has been notable during the past five years. Something like sixty to seventy miles of new railway are constructed annually, and along with their operation the most remarkable developments of industry in the Hokkaido have taken place.

To-day the imperial government railways operates 1,200 miles of lines in the Hokkaido. These are the trunk lines which connect the north with the south and the east with the west. In all Japan, including the Hokkaido, the imperial government railways operates 6,300 miles, so that the undeveloped Hokkaido alone contains one-fifth of all Japan's official railway mileage. There are five private railways, including light railways, in the Hokkaido which operate sixty-four miles of line.

The imperial government railways project the construction of the following lines during the next six years, viz. :—

Names	Distance	Projected date of completion
Soya Line ...	Kishibetsu—Wakanai	1922 do.
Rubeshibu...	Shin Asahigawa—Rubeshibe	1923 „
Shokotsu ...	Shokotsu—Sakkuru	„ „
Teshio ...	Otoishifu—Kabaoka	1924 „
Aioi ...	Bihoro—Aioi	„ „
Kamishihoro	Obihiro—Joshihoro	„ „
Kushiami ...	Kushiro—Abashiri	1926 „
Chorin ...	Nagamabe—Wanishi	„ „
Hahoro ...	Rumoe—Hahoro	1928 „
Uryu ...	Fukagawa—Uryu	„ „
Engaru ...	Rubeshibe—Engaru	„ „
Setana ...	Kuninui—Setana	„ „
Hyocha ...	Hyocha—Hishikawa	„ „

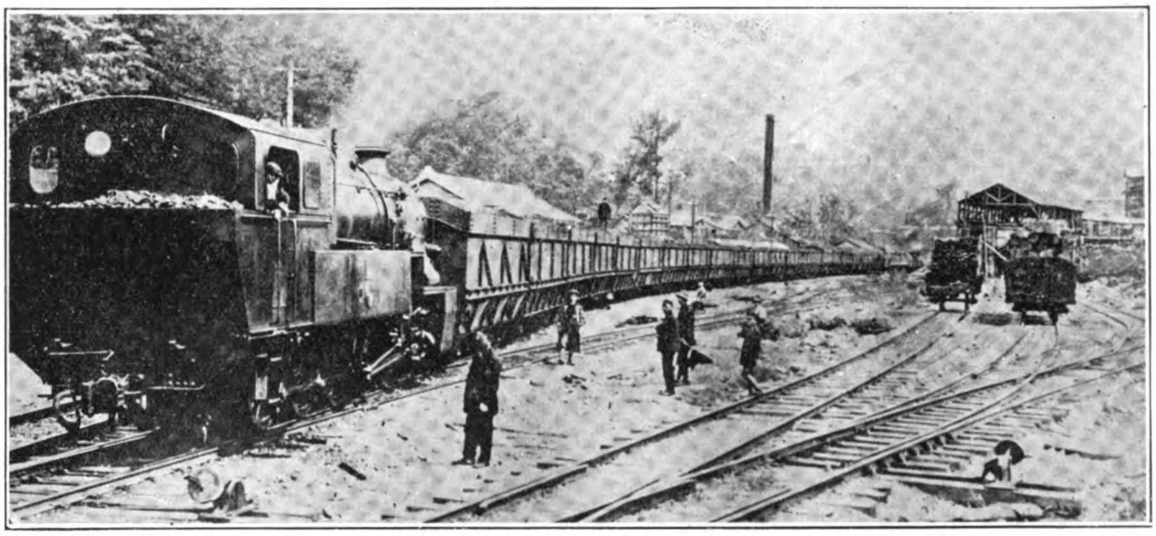
With the opening of the Soya line, the communication between this island and Karafuto will be shortened considerably.

The railway department also plans to improve the lines now in operation and the first of this work will be the double tracking of the Muroran-Oiwake line. After this line is completed the distance between Iwamizawa and Takigawa will also be double-tracked. The principal improvement that the department desires to make, however, is that in the connection between Hakodate in the Hokkaido and Aomori, the terminus of the main line between Tokyo and the north on the main island. Between the two ports in the past it has been necessary to transfer all passengers and all freight either port. The improvement planned consists in the operation of four ferry boats on which both passenger and freight trains can be transported across the straits. Two of these ferry boats have been ordered, and it is announced that they will soon be completed and put in operation.

One of the great industries in the Hokkaido is fishing, and the supplies of fresh fish on the main island are always below demand. In order to transport fresh fish from the Hokkaido to the district around Tokyo, the railway department has placed an order for many refrigerator cars, something which has not yet been seen in Japan. One thousand five hundred freight cars are also under construction for use in the transportation of timber only.

Bibai Coal Mine Station of the Bibai Railway in the Hokkaido

The Locomotive drawing 80 loaded Coal Cars was made at the Kobe Works of the Mitsubishi Zosen Kaisha, Ltd.



From the point of view of passenger traffic, the Hokkaido is rich in beautiful scenery and there are many famous hot springs which attract visitors at all times of the year.

Private Railways

There are five private railways in the Hokkaido, the Bibai, Tomakomai, Jozankei, Noboribetsu and Sutsu railways. The Hokkaido Kogyo Tetsudo Kabushiki Kaisha (The Hokkaido Mining and Railway Company, Limited) will shortly open a new line. The government of the Hokkaido recently granted a subsidy of seven per cent. of the paid-up capital of all private concerns which would undertake railway operation on that island. It is expected that this assistance will materially expedite the construction of railways.

Bibai Railway

The Bibai railway runs from Bibai station on the imperial government line to the Bibai coal mine, a distance of five and one-tenth miles. Although the line is comparatively short, it shows the best business results of any of the private companies in the Hokkaido, due largely to the Mitsubishi Bibai coal mine which annually ships from five hundred thousand to six hundred thousand tons of coal over the railway. The mine is planning to greatly increase its production.

The immense Bibai coal deposit, purchased by the Mitsubishi Mining Cmpany in 1920 from Mr. Entaro Iide, is of an exceedingly good quality. Its present output of six hundred thousand tons is to be increased to a million tons a year. The vertical shafts now being bored will be completed by 1926 and the railway company is preparing to take care of the increased volume of freight.

The standard grade of the railway is $\frac{1}{47}$. Heavy grades are laid with 75-lb. rails with 60-lb. rails on the level. The freight cars are of 24 to 30 tons capacity. There are very few passengers and most of these are miners and the members of their families. The average daily number of passengers is about three hundred. When the mine was at the height of its prosperity in 1920, more than 600 passengers were carried every day.

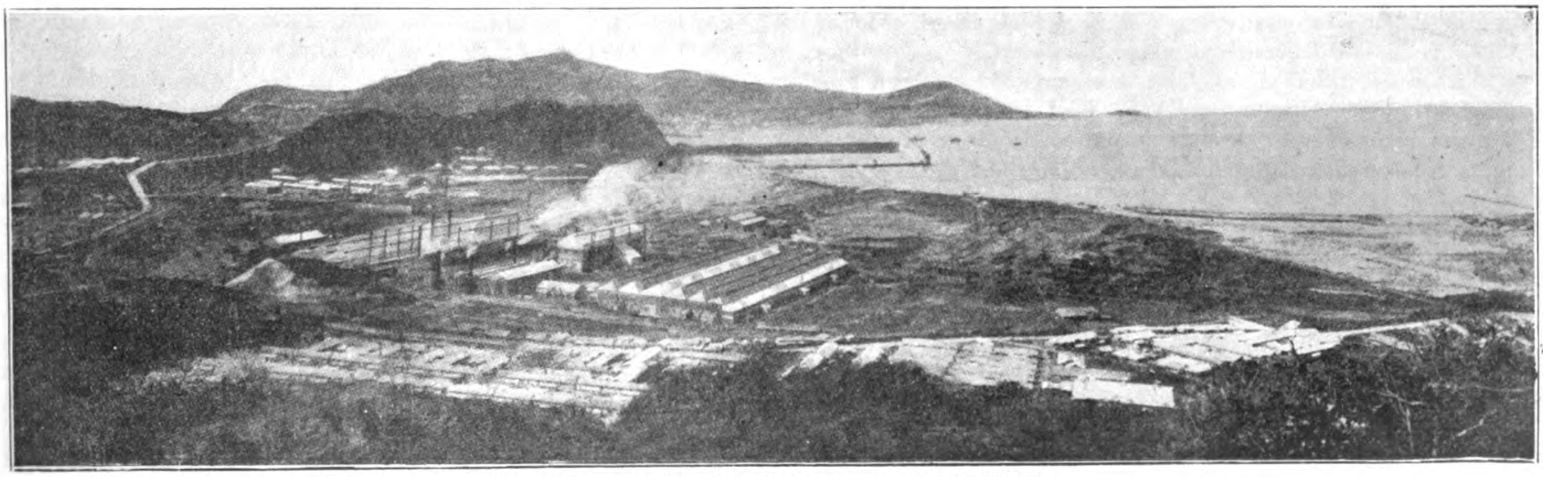
The Bibai Railway Company owns two super-heated freight locomotives and four passenger locomotives of less powerful type.

The railway is closely connected with the Bibai Coal Mine Company being managed by the Mitsubishi. Mr. Ichini Mitani of the Mitsubishi Mining Company, Limited, and Mr. Kame Saburo Ikade, the president of the Bibai mine, are members of the board of directors, but the actual management of the company is in the hands of Mr. Ryoichi Mori, at one time an official of the railway department, who entered the Mitsubishi in 1917, receiving his appointment as manager of the Bibai mine in 1918.

With a capital of Y.1,200,000 paid up, the company has been paying eight to nine per cent. each business term. At the same time Y.60,000 a term has been put in a special reserve for decreasing capital, so that at the end of twenty years the total capital will have been returned.

Sutsu Railway

The Sutsu Railway Company operates a line from the Kuromatsu station of the Hokkaido government main railway to Sutsu-machi, a distance of ten and a half miles. Sutsu-port, the terminal, an important centre of communication by land and sea for several hundred years, is rich in marine products and at one time was very prosperous. When the main railway connecting Otaru and Hakodate was completed, Sutsu was left ten miles away. Frequent appeals were made to the government which declined to build a branch line, so it became necessary to build a private railway in order to keep the town alire. With the help of capita, in Hakodate, the Sutsu Railway Company, Limited, was organizedl The license to construct a railway was granted in February, 1918. and in August 1918,, the company was organized with a capital of



The Japan Steel Works at Muroran, in the Hokkaido

Y.500,000, which has since been fully paid up. The officers of the company are :—

President and Director, Hejiro Sasaki ; Managing Director, K. Hata ; Directors : T. Sakai, E. Hyodo, J. Tsuchiya, K. Inukami and C. Nakada ; Auditors, Z. Tachikawa and T. Umemura ; Advisors, H. Narazaki and K. Okada.

The right of way was purchased and construction commenced in the spring of 1919, and in October, 1920 the line was open to business. Its cost of construction was approximately Y.900,000.

The opening of the line has greatly stimulated business, especially the transportation of fish. There are large farms and rich agricultural and mining districts in the district served by the Sutsu railway. The bay of Sutsu, a fiahing as well as a commercial port, is the only shelterd harbor between Hokodate and Otaru. The authorities are now planning harbor improvements, which will again make Sutsu an important marine transportation centre.

The cost of the construction of the railway line exceeded the capital of the company by more than Y.400,000. This difference was met by a loan from the Hypothec Bank of Japan, at a very reasonable rate of interest.

Jozankei Railway

The Jozankei Onsen K.K. owns the famous hot springs of Jozankei, which failed to attract visitors because of the inconvenience of reaching it. Residents of the town therefore organized a railway company and a line completed in October of 1918, from Shiraishi station on the Hokkaido government railway's main line to Jozankei, passing through Toyohira, a distance of 18⅝ miles. Since its opening, passenger traffic has increased by ten per cent. each business term and in proportionate manner the general business condition of the company has also improved.

The imperial timber preserves, situated in this railway zone, ship a large amount of lumber. Building stone is also shipped from the Ishikiri mountains. The Hou silver mine belonging to the Kuhara Company is also situated in the railway zone. The future of this line is, therefore, very bright.

The company is capitalized at Y.800,000 fully paid up. Its officers are : President, Motosaburo Kaneko ; Managing Director, Kinzo Oshima ; Directors, O. Kawamura and Y. Nakanishi ; Auditors, Y. Ishida, S. Yoshioka and K. Yamamoto ; Manager, G. Tachibana.

Tomakomai Keiben Tetsudo Kabushiki Kaisha

This railway, operated by the Oji Paper Manufacturing Company, Limited, is the longest private railway in the Hokkaido, running from Tomakomai to Saruta, a distance of 25.1 miles. It was originally constructed to transport the timber necessary for the Oji paper mills. In recent years, however, other freight has been developed and passenger traffic has increased so that the railway has become an extremely prosperous one.

The principal freight is timber, sent down from the logging district of the upper Sariyu River, and landed at Saruta, where it is loaded on the cars for transportation to the Tomakomai mill of the Oji Paper Manufacturing Company. A large amount of charcoal is also loaded at Saruta and Mukawa.

With a capital of Y.500,000, the company has been making a half-yearly profit of more than Y.37,000. During the last term of 1921, the income from passengers amounted to Y.42,400, from freight, Y.158,000, of which Y.56,000 was paid by the Oji Paper Manufacturing Company.

This railway is the only means of communication with the Hitaka district. A number of branches are being planned to connect with this line. One of the schemes is a new company, to be called the Saru Tramway Company, Limited, capitalized at Y.150,000, to build a branch line of eight miles from Saruta to Hiratori, on the Saryu river. This was licensed to begin business during June. Later on, this line is to be extended 19 miles to tap a large limestone and coal deposit in the interior. It is also reported that the Nissho railway which will connect Saruta and Urakawa of Hitaka province, where there is a branch office of the Hokkaido government, plans to make the Tomakomai Light Railway Company the basis of its line. The Nissho railway, recently licensed, will have 50 miles of line and construction work will be begun in the very near future. When this new railway is completed the Tomakomai railway should be swamped with freights which will be sent from the virgin soil of Hitaka province.

Hokkaido Mining & Railway Company, Limited

A new railway enterprise called the Hokkaido Mining and Railway Co., was licensed in July, 1918, to build a railway from Numanohata to Kanayama, and from Sapporo to Numanohata, with several branch lines, totaling in all 131 miles of new railway. The plan is to build lines which connect with the government railway main lines, especially the line to Muroran, and to extend branches into the great coal fields along the main lines. The authorized capital of this company is Y.10,000,000, of which one-fourth will be paid up by August this year.

Construction was begun in May 1920, despite the adverse conditions of the financial and industrial world, and a part of the projected line as completed and opened to business on July 24.

The section between the terminal at Numanohata and Ikubetsu, a distance of 22 miles was opened on July 24. Between these two places there are only two stations Kami Mukawa, and Kami Azuma. The steepest grade is $\frac{1}{80}$, and the gauge is the same as the government lines, 3-ft. 6-in. A sixty-pound rail is used, and will be used on all the lines, except in the places where traffic will be heaviest when a 75-lb. rail will be used.

During 1922 a section between Ikubetsu and Hetonai, some 20 miles, will also be opened. During 1922, therefore, more than 42 miles will be completed, at a cost of Y.3,000,000, it is estimated.

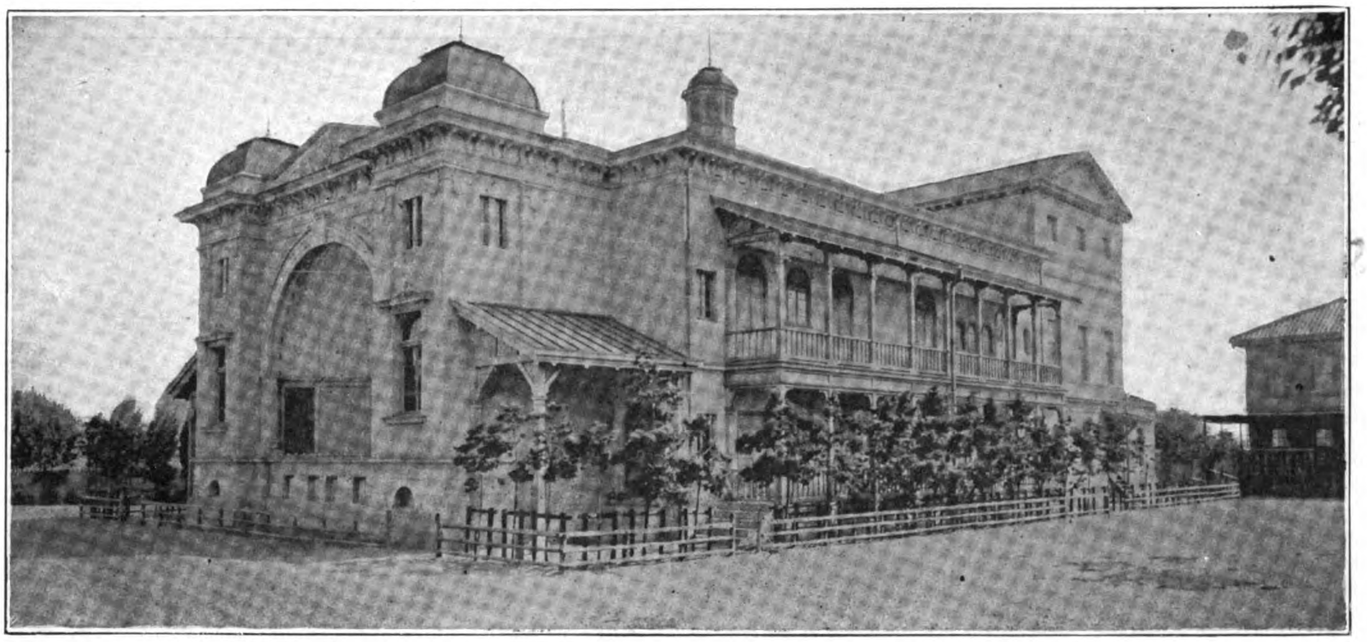
As soon as this section to Hetonai is completed work on the Numanohata-Kanayama line will be abandoned for the time and the Sapporo-Numanohata line will be begun at once. Between Numanohata and Sapporo the line will be 36 miles, and the branch line between Chitose and Oiwake will be ten miles long. The line is most anxiously awaited by the inhabitants in the zone of the projected railway, and the land for the right of way has already been acquired, largely by free gift of the delighted colonists. The actual work of construction will be begun very shortly, and when the line is opened to business a distance of some 30 miles in direct travel will be saved. The government line now in operation, which reaches both Sapporo and Numanohata covers 64 miles, the Hokkaido Kogyo Tetsudo line will be only 36 miles. The projected private line will form the base of the triangle made by the government lines from Sapporo.

The construction of the line between Hetonai and Kanayama will be more difficult than that of any other part of the projected railway lines. It is now being suggested that Kanayama be abandoned as the terminal and Ochiai substituted instead. In any case this line will connect the government Kushiro-Hakodate line with the government Muroran main line. The estimated distance of the future extension is forty miles, besides the branch line from Hobetsu to Naka Hobetsu, some five miles. The Naka Hobetsu district is near the Yubari coal field and there are enormous resources of coal and iron ore there for the tapping.

This railway company was planned to exploit the virgin mines of coal and iron along the railway zone. In the district covered by this company's lines the River Mukawa, one of the six large rivers of the Hokkaido flows. There are many forests along this river, as yet untouched with the axe, and there are agricultural villages which have no communication with the outside world. The village folk all along the different lines are most enthusiastic about the lines, and are giving all the help in their power to make the project a success.

The future of this railway company seems very promising. It has attracted a great deal of attention by touching several very rich undeveloped districts of the Hokkaido, and deserves well of the public for its plans.

The Hokkaido government allows a subsidy of 8 per cent. to this company.



Recreation Hall for the Mill Workers Employed by the Kanegafuchi Spinning Company, Ltd.

Ideal Industrialism in Japan

By Laurence Impey

IT has so happened that I have often found myself unsympathetic towards certain of the tendencies of modern Japanese life, which have appeared to me to be far too largely colored by the influence of the comparatively small political and militaristic cabal.

As, therefore, I am convinced of the innate kindness of the Japanese people as a whole, it is with the more pleasure that I put on record the favorable impressions I received during my visit to the factories of Messrs. Kanegafuchi, Ltd., which I would like the reader to appreciate with me, more particularly if he or she be interested in the economic conditions of the present day and the amelioration thereof.

I was greeted on my arrival by Mr. Tawada, the manager, to whose courtesy I am indebted for the information embodied herein, and who spent three hours in showing me one of the model factories of Japan, one indeed which rivals, in my opinion, any of the factories of the world.

My first visit was to the dining rooms, where the employees were having their midday meal, the time being eleven o'clock, when the whole factory halts for forty minutes' rest.

This may seem a short period to those accustomed to western trade unionism, but the eight or ten-hour day seems to be satisfactory to the Japanese worker up to the present, and I cannot say that I observed any signs of overstrain in the four thousand hands amongst whom I went.

The food in the dining rooms is prepared in the Company's kitchens, which I can certify are spotlessly clean, and as far as a few months acquaintance with Japanese food had made me any judge I should say it was of excellent quality, as it certainly was in quantity.

The cost to the employees amounts to ten cents per day for females and fifteen cents for men, which is well under cost, so much so that the Company last year had to meet a deficit of over £100,000, a figure which sounds surprising, but which the manager assured me was well worth while in its resultant increased efficiency and well-being of the work people.

We passed directly from the dining rooms into the general store, where the employees can purchase various articles of food, dry goods, and household necessities at cost price, a service which is certainly fully appreciated by the workpeople, for the counters were thronged with would-be buyers as we passed through.

The whistle blew, and all the workpeople streamed out, four thousand strong, some going on duty, some going off, and following in the wake of the latter we came to the dormitories.

These are provided for both male and female workers, long light airy rooms, with bedding both on the European and Japanese style, and attached to them is a room where relatives of the workers can stay during a short periodical visit free of charge.

The married employees have houses provided for them, at a rental which is about one-third the current local price, and if there are insufficient houses available it is the practice of the firm to make an allowance towards the rent of some suitable house in the vicinity.

The rents received from the Company's houses are set aside to form a repair and building fund, instead of being turned in to the usual profits and loss account, and as a result of this improvements and additions are being made all the time to the living area.

We went next across the compound to the hospital, a compact building, very clean and with a well-equipped surgery and operating room, and wards for the operatives of both sexes.

Skilled practitioners in the various branches of medicine are always in readiness, and health amongst the employees is encouraged by inspections of the works from time to time.

Any case of illness or injury while on duty is at once passed to the hospital, where the patient is maintained at the Company's expense during his or her illness, full wages being paid, from which is deducted a small charge for medical attention.

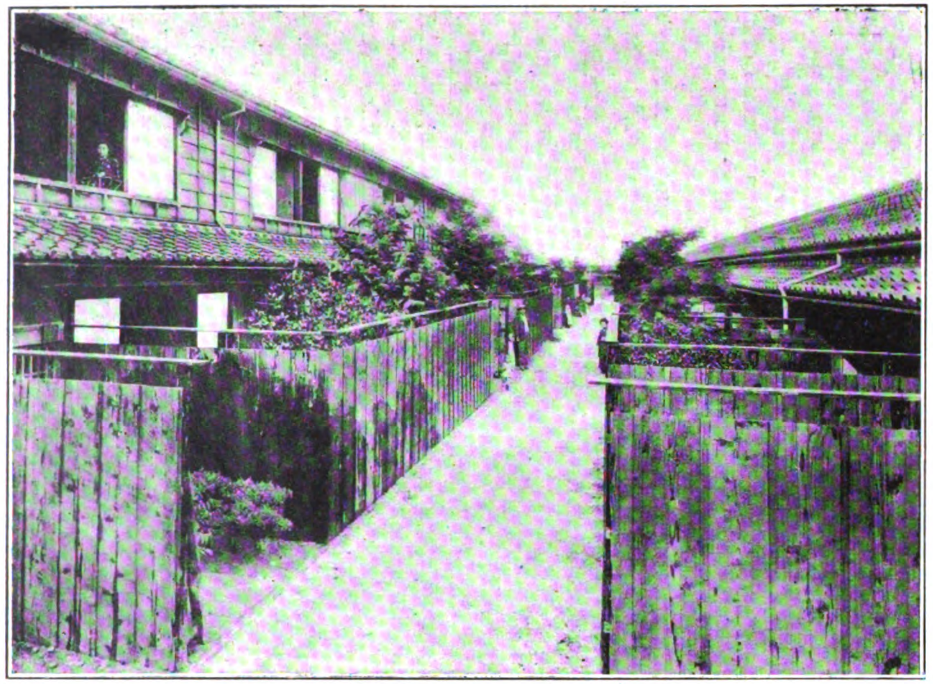
In the case of extended illness or incapacitation from work the matter is considered by a Relief Committee, composed of the heads of departments and various representatives of the employees.

A report or recommendation is made, and forwarded to the managing director for his approval, when the sufferer will receive a pension estimated on liberal terms based on the years of service.

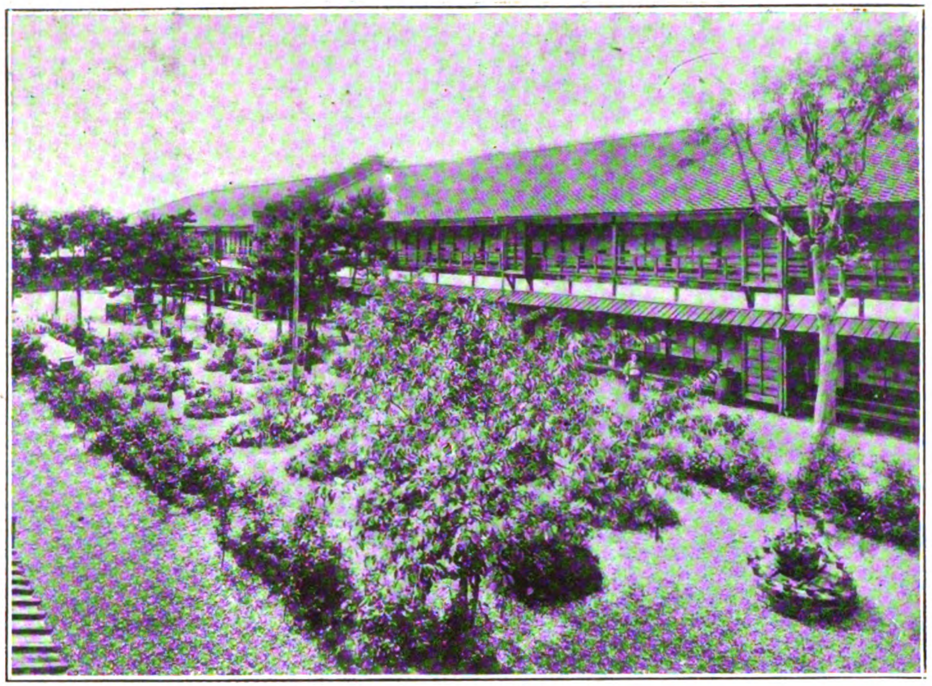
In connection with the question of sickness the Company has given especial care to the subject of tuberculosis, and immediate examination and treatment is given to suspect cases, while two sanatoria have been established at the sea to which the employees can be sent on the recommendation of the staff doctor.

IDEAL INDUSTRIALISM IN JAPAN

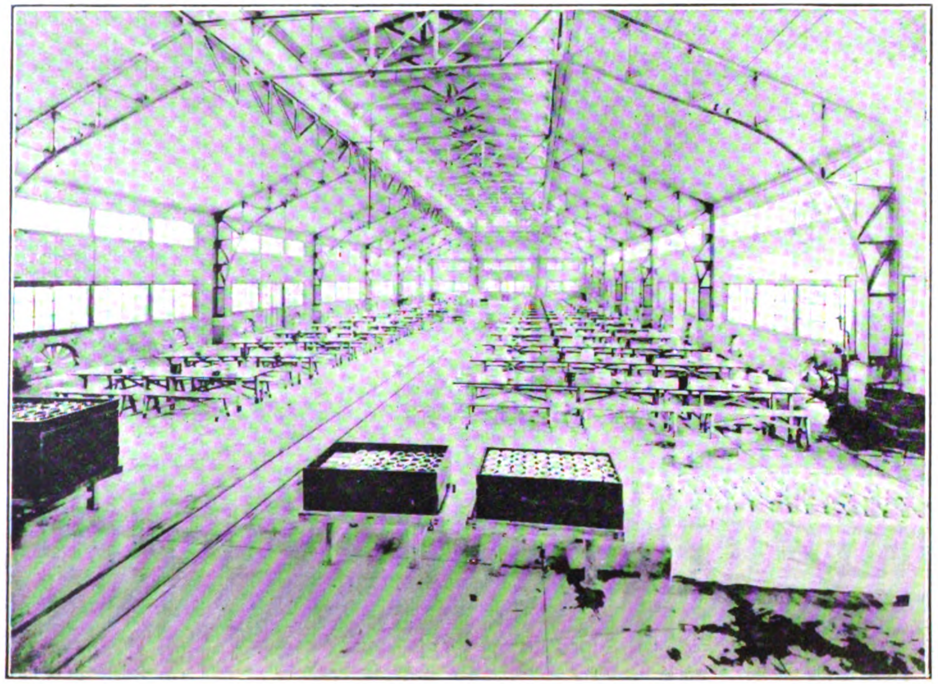
How the Kanegafuchi Spinning Company Watches over the Welfare of its Workers



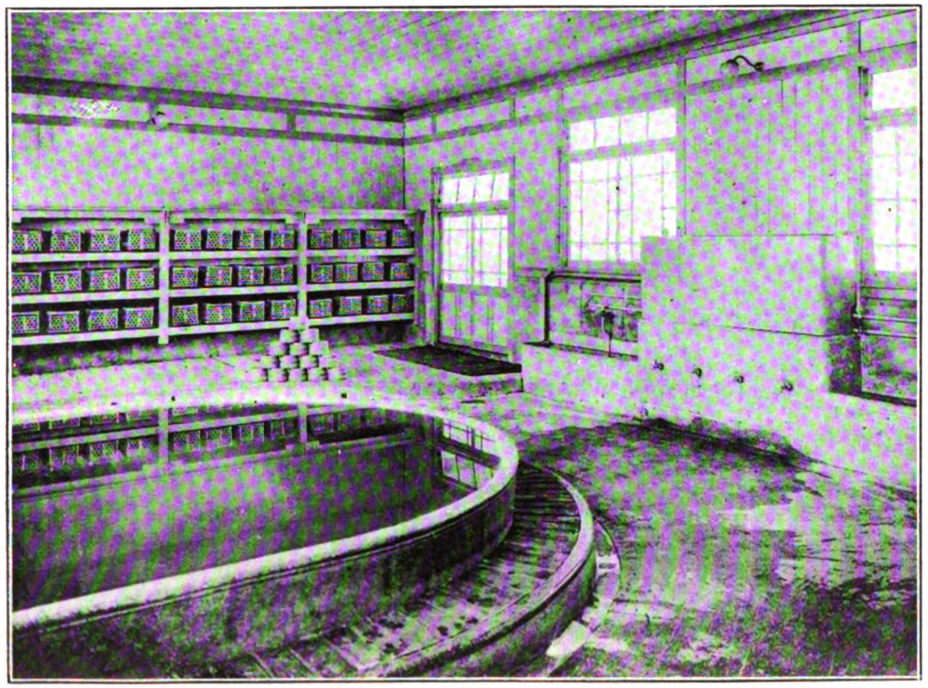
Workmen's Cottages



Women's Dormitory



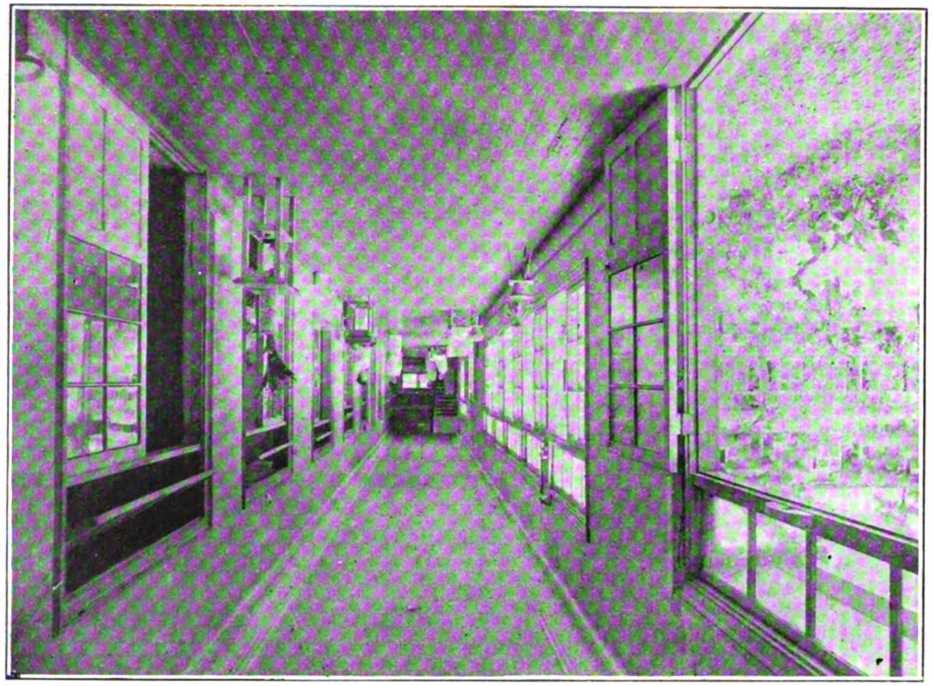
Dining Hall



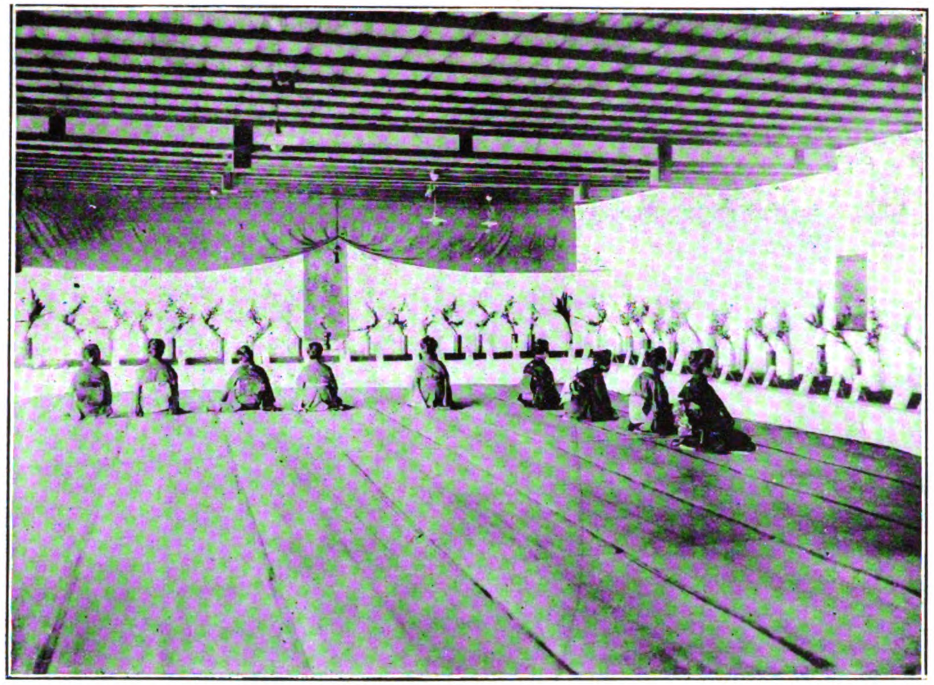
Bath Room

IDEAL INDUSTRIALISM IN JAPAN

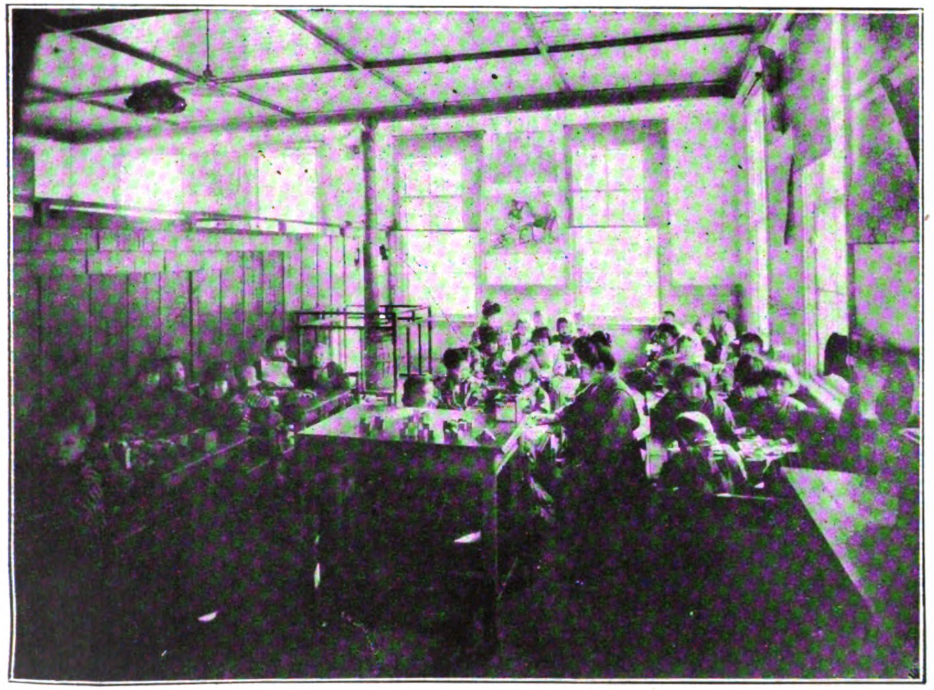
The Kanegafuchi Idea of the Proper Relation Between Capital and Labor



The Hospital



Display of Flower Arrangement by the Female Operatives, in the Main Hall of the Dormitory



The Kindergarten

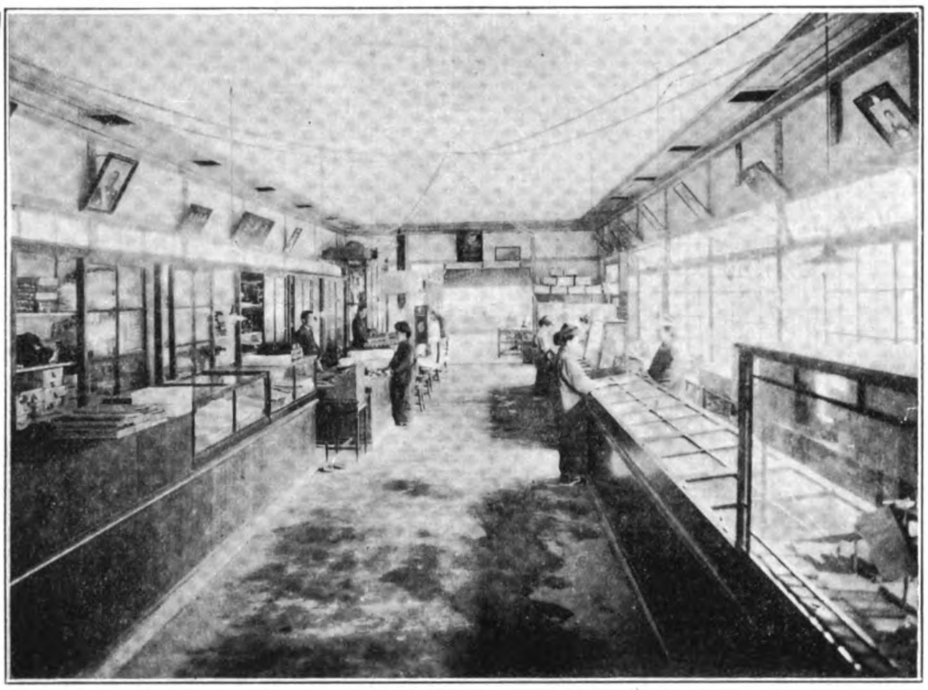
The Play-Ground

Health is encouraged in every way possible, for the bath rooms provided on the works are models of their kind, and I can vouch for it that they are used to the limit of their capacity.

The operatives change their dresses on going to work, and the soiled ones are taken to the works laundry and washed immediately, a measure of a value which can hardly be estimated.

Of course the Company is assisted in this by the fact that there is no nation on earth that is so addicted to hot baths as the Japanese, and also that the climate is sufficiently temperate to obviate the ill-effects that would probably follow snch exposure in Europe or America.

After going into the question of pensions and sick benefits with Mr. Tawada in more detail than I feel at liberty to do here, we turned to the question of education.



The Retail Company Store

First I was shown the Creche, where the young children of the employees can be left during the day in the charge of skilled nurses while their parents are at work or asleep after being on night shift.

Next, we went a few yards further on to the kindergarten, the next stage in the development of the young idea.

A dozen or more children were engaged in cutting out paper figures or in weaving bamboo work, but though they were bursting with curiosity they rose and greeted me very gravely as befitted a visitor, though it was evident that my companion was such a familiar figure that only my presence restrained them from some more intimate demonstrations.

After the children of employees have passed through their primary and secondary school education it is possible for them to advance further in their studies by means of the educational fund which the Company has founded.

Direct grants may be made from this, or alternatively, sufficient funds may be loaned the student or his parents to carry him through college or the university, subject to gradual repayment without interest in a period of ten years from the date of obtaining a position.

This, I estimate, is one of the most useful of regulations from the point of view of both employer and employee, for there is no one subject nearer to the heart of the parent in most cases than the advancement of their children, and that this is so is amply proved by the number who have taken advantage of the possibility in the last few years, and are now holding positions in the employ of the Company in their turn.

One point came to my notice which will be of interest to some, the question of employees on military service.

The practice of the Company is to pay seventy per cent. of the wages to the dependants during the soldiers' absence, and reinstate him with an average increase of pay or other promotion on his return.

This compares very favorably with the practice of business houses in any other country of which I have cognisance, and must go far towards ameliorating the hardships of conscription.

With regard to other minor items in the Company's program, I would just mention the establishment of tennis courts, baseball ground, etc., on the athletic side, two periodicals on the educational side, and the founding of a savings society to protect the pay of employees, which society, I would mention, pays the rate of 10 per cent., which is satisfactory enough considering the security of the money.

These points which I have enumerated above are only a few of those which struck me, and I could write at length about the cinema theatre, the stage and its dramatic society formed amongst the workers, and countless other items of interest, but enough has been said to indicate the lines on which the works are run, and for the results I can do no better than quote you the words of Mr. Tawada as I was leaving.

" There are on strikes," he said, and in that you have the matter in a nutshell.

The products of the mills, both from American and Egyptian cottons, are used chiefly in Japan ; in fact it may be said to be a case of Japan for the Japanese, and if only the other industries in the country will follow the lead thus given them it may be possible for them to escape the industrial unrest and disintegration which is almost universal.

Chinese Chemists Organize

The American chemical society may be the parent of the future "Chinese Chemical Society," according to information from Dr. Robert E. Swain, of the department of chemistry, Stanford University, California.

At a meeting of Chinese students, majoring in chemistry in the University of California and Stanford University, held at Stanford University some time ago, steps were taken to bring together into one organization all of the hundred or more Chinese students engaged in work in chemistry and chemical engineering in the universities of the United States, Dr. Swain reports.

The purpose of the organization, as stated in the constitution which was adopted, is to bring all Chinese engaged in work in chemistry in America into more intimate relationship professionally and socially ; to encourage a wider interest in the study of chemistry by the Chinese students at home and abroad, and to promote a higher appreciation of the place of chemistry in the growth of the Chinese nation and the advancement of its people.

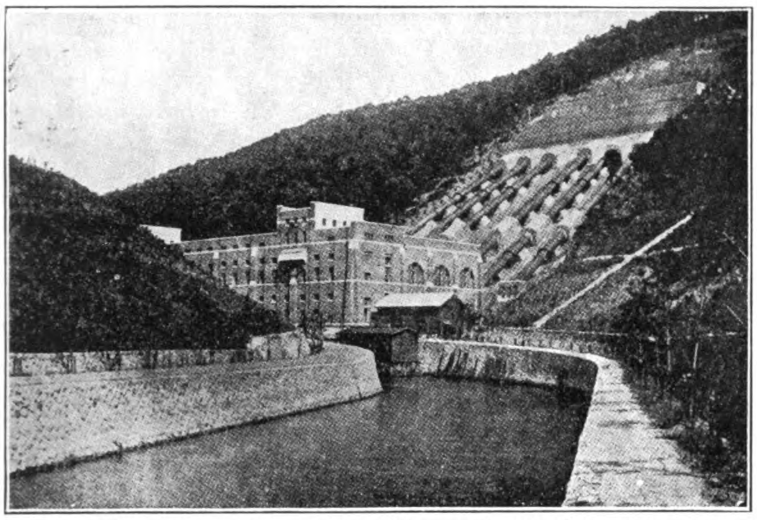
The organization is to be called " The Chinese Students' Chemical Association," and already has thirty or more members in western universities. It is expected that before the beginning of the next academic year, the membership will be extended to all of the universities of the United States.

Electrical Developments in Japan

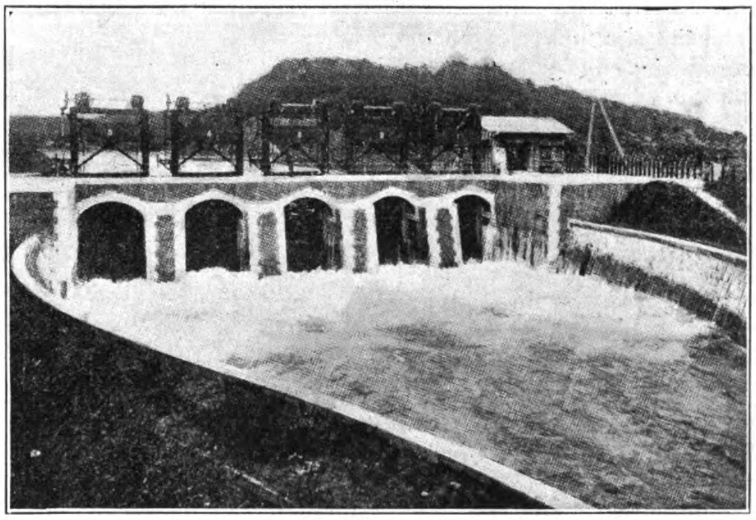
THE UJIGAWA COMBINE

IN September 1921, the Ujigawa Denki Kabushiki Kaisha (Uji River Electric Co., Ltd.), absorbed the Omi Suiryoku Denki K.K. (Omi Hydro-Electric Power Co., Ltd.), and in October, the Yamato Denki K.K. (Yamato Electric Co., Ltd.) At the same time the Ujigawa was actively engaged in building its No. 2 plant, and drawing up plans for a No. 4 plant, and a great steam generating station. Both the Omi and Yamato companies have large construction schemes underway, which, when completed, will make the Ujigawa organization one of the largest in Japan.

The original Ujigawa Denki K.K. was established in 1906, and its first hydro-electric power plant at Uji city on the Uji river was completed in July 1913. The head office of the company is at 98 Kami Nichome, Sonezaki, Kita Ku, Osaka City. During the war when the profits of all electric power companies were very great the Uji and the Inawashiro Hydro-electric Companies, were the only power enterprises in Japan which failed to pay 12 per cent. dividends. The profits of the Inawashiro were maintained at a low level because of the high cost of constructing its new power stations and main transmission lines to Tokyo; added to the fact that all its power was sold to the Tokyo Dento K.K. on a long-term contract at a very low rate.



No. 1 Power House of the Ujigawa Electric Company



Sluice Gates of the Ujigawa Electric Company

During the first two years of the war, the Ujigawa generated only 23,350 kilowatts; from 1916, this was increased to 29,000, by increasing the head of water at its principal generating station. The Osaka Dento K.K. bought 2,500 kilowatts in the daytime, and 32,-kilowatts at night. Four thousand kilowatts were supplied to the Kyoto Dento K.K., and the Osaka city electric bureau bought 2,000 kilowatts. Besides these large consumers, the government arsenal, mint, and several big industrial concerns bought a considerable amount of power. The 29,000 kilowatts generated from its own power plants was not enough to meet all demands so the company bought 10,000 kilowatts from the Osaka Dento K.K., which was supplied from that company's steam power plant in Osaka city.

The Ujigawa Denki K.K. supplied power to the Osaka Dento at 8 *rin* (four-tenths of a cent U.S. gold) per kilowatt, and to the Osaka city electric bureau at 6 *rin* (three-tenths of a cent U.S. gold) per kilowatt. But it bought power from the Osaka Dento on a sliding cost scale, based on the price of coal at Y.50,000 per 10,000 *kin* (13,333 pounds). For every advance of five *yen* per coal unit, the Ujigawa was obliged to pay 1.2 *rin* (three-fiftieths of a cent U.S. gold) more per kilowatt. During the war the price of coal rose without ceasing, and the Osaka Dento's charge for power supplied the Ujigawa rose too. Unfortunately the company's selling contracts were not on a sliding scale of charges and consequently it was unable to show such splendid profits as other companies supplying power in the great industrial centres. It did manage to raise its own charge to the Osaka Dento to 1.4 *sen* (seven-tenths of a cent U.S. gold) in July, 1918, but coal still continued to rise, and even up to the present time, the Ujigawa Dekni is much handicapped by the high price of coal, and the consequent high cost of the power purchased from the Osaka Dento.

This serious handicap made the directors turn their attention to increasing the company's supply of water power. It was decided to construct the No 2 hydro-electric plant, and a large coal-burning station at Fukazaki, Nishi Ku, in the suburbs of Osaka.

Before building the No. 2 power plant, it was necessary to enter into an understanding with the villages along the Uji River. This required long-drawn-out negotiations and permission was not easily obtained. Construction is now being rushed on the Fukazaki coal-burning power plant, which occupies 875 *tsubo* (31,500 sq. ft.). The effective generating capacity of this station will be 20,000 kilowatts, with 10,000 kilowatts reserve power for emergencies, a total of 30,000 kilowatts. In May 1920, five thousand kilowatts of plant were installed and the balance will be in operation by the end of 1922.

Osaka lies in the midst of a great plain, and water power must be obtained from distant sources. In the beginning of the hydro-electric industry in Japan it was difficult to transmit power over long distances, but to-day conditions have been so advanced and power equipment so greatly improved that distance no longer deters such enterprise. The Daido Denryoku K.K. and the Nihon Denryoku K.K., have built power houses in Shinano, Etchigo and Hida provinces in central Japan, a hundred miles and more from Osaka. The Nihon Denryoku will supply this year 20,000 kilowatts from its distant power houses to Osaka; next year, 45,000 kilowatts, and in two or three years it will generate 100,000 kilowatts for transmission to the industrial centre of the country.

The largest supplier of hydro-electric power to Osaka to-day is the Ujigawa Denki K.K. When the above-mentioned two new companies enter the field in competition, the power situation in Osaka will be greatly complicated.

Despite the relation of buyer and seller existing between the Ujigawa and the Osaka Dento they are bitter rivals for supremacy in Osaka, and as the Daido Denryoku is operating in connection with the Osaka Dento, the Uji company has another formidable competitor to face.

It behooved the Ujigawa not to stand idle and await this threatened competition, and in order to prepare for the future the amalgamations with the Omi Suiryoku and the Yamato Denki were carried out.

The Omi Suiryoku possesses a license for the exclusive supply of light and power in 130 towns and villages in North Omi province. Its boundaries embrace the towns of Hikone, Yawata, Nagahama and Minakuchi, where industry is making great strides. There is a great demand for power in Omi, but little supply at present.

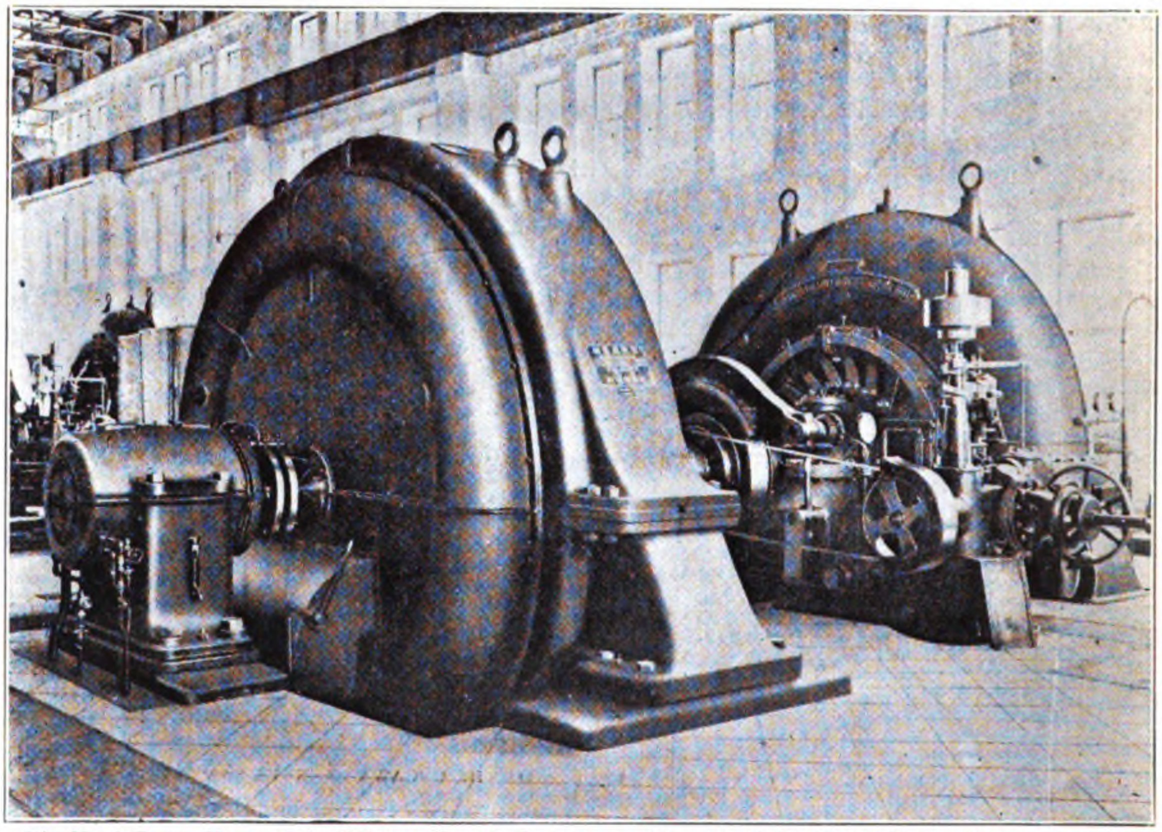
The Yamato Denki is licensed to supply light and power in certain districts in Nara prefecture. Oji, Gojo, Kamiichi, and Shimoichi lie within its boundaries. So far, this company has shown very poor results, and the reason for the merger with the Ujigawa is easily understood. The districts between Nara and Wakayama in which the Yamato Denki operates, are watered by two rivers, the Totsuka river and the Kumano river, which have great potential power in their upper reaches.

The Ujigawa and the Nihon Denryoku are related companies and will not compete, but the Daido Denryoku will be a serious competitor. According to inspired statements the Daido will supply power in Osaka at 3 *rin* per kilowatt less than the Ujigawa. The Daido holds a license to supply power in Osaka, but it has not yet succeeded in obtaining a license to supply light, but because of its relations with the Osaka Dento this class of business will perhaps not be attempted in Osaka city. However, because of the uncertain market for power, which varies in consumption according to economic conditions, all electric power companies are eagerly seeking licenses to supply light, for which the demand has never decreased, but continually grows greater and greater. The large power concerns are all trying to obtain control of small local lighting companies, and the Kansai Denki already mentioned, has annexed ten and more companies with this end in view. The Daido and the Kansai are both financed by the same capitalists, and hopes are expressed of an eventual merger. Such an amalgamation would be very advantageous to the Kansai as the Daido owns many very valuable power sites and licenses.

The Daido, and the Kansai are both operating in the vicinity of Nara, and if they should obtain power sites on the Totsuka and Kumano river, it would place the Ujigawa on a very disadvantageous position with powerful competitors on all sides of it. The Yamato Denki business has still to show good results, but it owns valuable power rights on these two rivers, and is potentially very powerful. From the Yamato power sites to Osaka is 50 miles, while from the Daido's Yomikaki power plant on the Kiso river to Osaka city it is 144 miles. The Yamato's lines need be only one-third this length. This was the reason behind the purchase of this concern by the Ujigawa Denki K.K.

The No. 1 power plant of the Ujigawa and the Fukuzaki power plant are exclusively for generating power for industrial motive uses. Since the merger with the Omi and the Yamato companies, the Ujigawa has commenced the supply of power for lighting. The present business of the company is listed below :—

No. 1 power plant generates	29,000	kilowatts
Fukuzaki plant ,,	20,000	,,
Omi Suiryoku owns four power plants generating	2,132	,,
Yamato Denki generates	1,050	,,
Water power	32,182	,,
Coal	20,000	,,
Total	52,182	,,



The No. 1 Power House of the Ujigawa Electric Company, equipped with Six Water Driven Alternators, 7,000 k.v.a., 12,000 volts, 360 r.p.m., 60 cycles, made by the Shibaura Engineering Works of Tokyo

Omi Suiryoku supplies	144,029	lights
Yamato Denki ,,	39,000	,,
Total	183,029	,,

The capital of the Ujigawa was originally Y.12,500,000, but this was increased to Y.25,000,000 in 1916. The capital of the Omi Suiryoku was Y.4,000,000, but it was purchased for Y.6,500,000, and on making the merger the capital of the Ujigawa was increased to Y.31,500,000.

The Yamato Denki was capitalized at Y.5,000,000, of which Y.2,060,000 was paid up. It was purchased at a valuation of Y.6,250,000, and the capital of the Ujigawa was expanded to Y.37,650,000 when the merger was made. Of this amount, Y.34,650,000 was paid up. The balance of Y.3,000,000 was paid in two instalments of Y.1,500,000 each in March and May of this year, making the present capital all paid up.

The total cost of equipment and construction of the Ujigawa Denki K.K. merger, to the end of May 1922, amounted to

Y.52,543,821. Debentures of Y.16,500,000 have been issued to meet the excess construction costs.

No. 1 water power plant	Y15,917,012
Fukuzaki steam plant	5,952,158
Osaka transformer station and equipment ..	13,633,561
Omi Suiden power equipment	2,029,333
Omi Suiden electric light equipment	3,240,025
Yamato Denki power equipment	976,837
Yamato Denki light equipment	735,967
No. 2 power house, estimated costs to date ..	4,166,366
Omi Suiden plans for expansion	1,661,948
Yamato Denki plans for expansion	4,430,614
	Y52,543,821

The No. 1 power plant transmits its power to a transformer station at Noe. The total cost per effective kilowatt generated, estimated at 26,500 kilowatts, was only Y.600.00 for the power plant alone. Including the Noe transformer station and all transmission line costs, this rises to Y.1,115 per kilowatt, which is not particularly expensive for this construction in Japan.

The costs of construction per kilowatt of effective power of the Omi Suiden was Y.95.00, and of the Yamato Denki Y.93.00. These are very low costs, but the equipment is on a very small scale, and construction was completed before prices rose, so they were built very inexpensively.

Averaging the costs of all the hydro-electric power generated by the present Ujigawa organization they amount to Y.514 per kilowatt. The amalgamations have therefor materially reduced the construction costs per kilowatt.

The Omi and Yamato supply 183,000 lights. The equipment for these lights cost Y.3,970,000, making the cost per light supplied Y.21.73. In places where population is large, this is not too high ; in Osaka city the average cost is Y.13.00 per light, but in North Omi, and in the Yamato Denki's boundaries, where dwellings are scattered over a great deal of territory, the average equipment cost per light is Y.21.00. The Fukuzaki power plant has cost Y.287.00 per effective kilowatt. Machinery is cheaper to-day than at the time the plant was ordered, but taken all in all this cost is not too great.

The Ujigawa Denki K.K. has many plans for increasing its power supplies. They include adding 42,250 kilowatts to its effective water power, and 30,000 kilowatts to the coal-burning plants efficiency. Two plants will be built to operate in the territory of the Yamato Denki, at Shirakawa and Suriko, to generate 8,000 kilowatts. In the boundaries of the Omi Suiryoku a plant to generate 2,250 kilowatts will be built at Kawada. The total estimated costs of construction for all these projects reaches Y.38,200,000.

The principal project under way now is the construction of the No. 2 power plant.

The No. 2 and the No. 4 power plants will utilize the stream of the Uji River. No. 2 is being built on the upper stream of the river about four miles up-stream from Ujibashi at Tawara Mura, Suzuki Gun, in Kyoto prefecture. A dam will be built to the opposite bank of the river, at Makishima Mura, Kuse Gun, and from the dam a canal 6,400 feet long will be constructed to the power house. The fall will be 150 feet, and the effective head of water 2,800 cu. ft. per minute.

The No. 1 power house generating 291,000 kilowatts receives an effective head of 2,800 cu. ft. from Ishiyama near Lake Biwa, by means of a canal beginning at Nango, which has a fall of 205 feet to Uji city.

Between Nango and Uji city, the Uji river makes two great turns, one at Ishiyama, and the other at Makishima. This last is a very great bend which the No. 2 power plant will utilize.

The No. 4 power plant will utilize only the excess of water from the No. 2 plant at Makishima. At No. 1 plant the Uji river gives 2,800 cu. ft. of water, at No. 2 the same amount, but during the season when the water is low, the head of water will be not at more than 2,000 cu. ft. The No. 2 and No. 4 plants will divide this 2,000 cu. ft., and 70-foot fall will be effective for the generator the No. 4 plant. However, it will not be able to operate at all times when the water is low. Its maximum efficiency is estimated at six months a year.

The No. 2 plant will generate 26,000 kilowatts, and No. 4, 9,000 kilowatts. At No. 2 one cu. ft. of of water will produce 9.3 kilowatts, at No. 4 it will produce only 4.5 kilowatts. No. 2 power plant is down stream from No. 1, and it will use the water of the main stream of the Ujigawa. The Uji river has a large volume of water, but its fall is slight. In this respect the Ujigawa Denki's source of power is like that of the Inawashiro Suiden. At No. 1 the fall is 1 in 180, but at the Inwasahiro No. 1 power plant the fall is 1 in 20. At No. 2 plant of the Ujigawa the fall is 1 in 34, and the ground and subsoil are very hard, and because of this the cost of construction will probably be high. The district, however, is most convenient for transmitting power to Kyoto and Osaka, and accordingly there will be little expense for transmission lines, etc. One kilowatt of effective power will probably cost from Y.630 to Y.640.

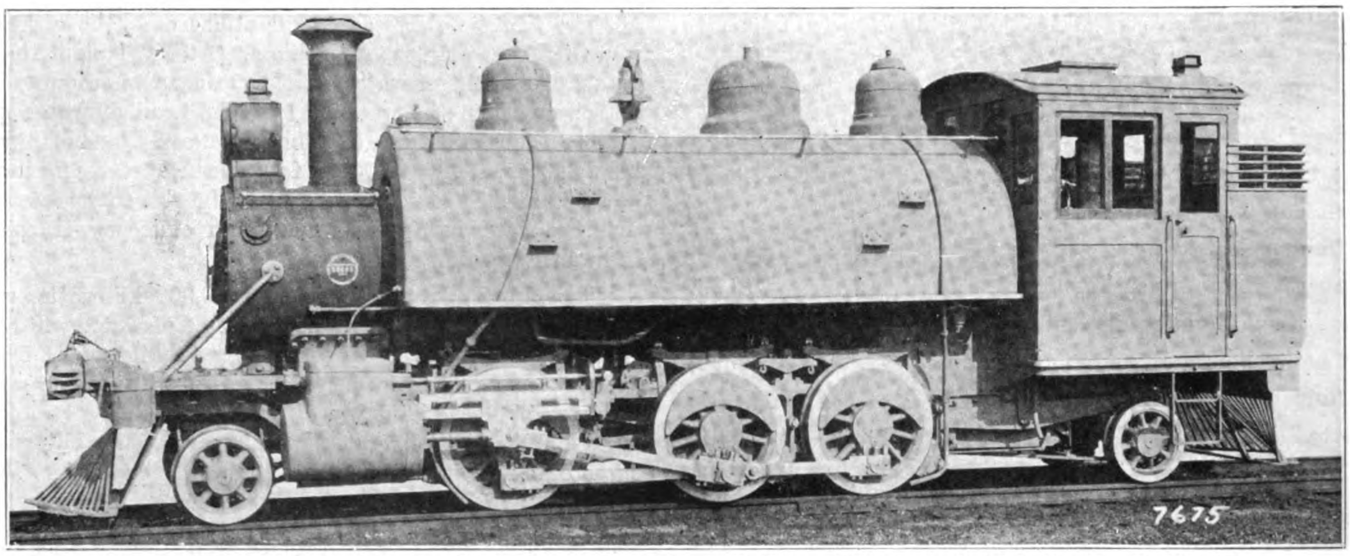
The great advantage the Ujigawa Denki over all competitors lies in its nearness to the consuming centres. Its power lines are gradually being improved and transmission losses have been cut to a minimum. From the Uji No. 1 power plant to Kyoto is only 8 miles, to Osaka 21 miles. The Inawashiro Suiden is 140 miles from Tokyo. The Daido Denryoku and the Nihon Denryoku are respectively 144 miles and 189 miles from Osaka. Consequently the profits of the Ujigawa compared to those of the other companies should be proportionately greater. No. 2 power house in comparison with No. 1 with its fall of 1 in 180 will have many advantages.

The Fukuzaki coal power plant might seem superfluous with these great potentialities from the Uji river. But it is extremely necessary to maintain a steady supply of power sufficient to cover all demands. Water power is insufficient and No. 4 station will be out of operation more than six months of the year. This is why the Fukuzaki station is being augmented by 10,000 kilowatts. Even this is insufficient because of competition with the Osaka-Kyoto Electric Railway, so a No. 3 coal-burning power plant to generate 10,000 kilowatts is now being planned.

No. 2 and No. 4 power plants will be completed in 1923. The Shirakawa power plant will be partly completed and in operation by October this year, and the Suriko plant will be completed in April, 1923. The Kawada plant was completed in April this year. Two coal-burning plants in Osaka and Kyoto will also be completed this year.

The No. 3 power plant to generate 10,000 kilowatts is now being worked out by the engineering staff. Another plan embraces the construction of a hydro-electric power house on one of the sites of the Yamato Denki, to generate 4,000 kilowatts. Costs of construction of all these plants and the necessary transmission equipment are estimated to be Y.44,700,000. In future, the light and power equipment of the Omi and Yamato companies will require expansion, and this will make more demands upon the company's funds. Besides the Ujigawa Denki will shortly be called upon to pay up a part of its share of the business of the Nihon Denryoku already mentioned as preparing to supply 100,000 kilowatts in Osaka within the next three or four years, in which the Ujigawa is one of the principal shreholders. A part of the outstanding debentures must also be redeemed shortly, and the Ujigawa Denki K.K., as it is now constituted, and with the plans for construction it has in hand, stands in need of about Y.60,000,000 to complete its plans.

It is generally believed in the money market that the Ujigawa Denki K.K. will double its present capitalization before the end of 1922. But even this will not provide all the money needed for construction. The balance will be raised by debentures.



"Prairie" Type Switching Locomotive for the Peking-Suiyuan Railway, built by the Baldwin Locomotive Works

Switching Locomotive for China

THE Peking-Suiyuan Railway which taps China's great northwest has now about 400 miles of standard gauge (4-ft. $8\frac{1}{2}$-in.) track open and is one of China's most important railways, from both political and industrial standpoints. The line was constructed entirely with Chinese capital and by Chinese engineers, having been originally conceived by Dr. Chan Tien-yu, better known to foreigners as Jeme Tien-yu.

Construction was started in 1905 under Dr. Chan, on the Peking-Kalgan section. In 1909 public service was begun. This section of line, about 122 miles long, is without doubt the most remarkable piece of railway engineering yet carried out in China. The tunnel under Nankow pass is the longest yet bored in China, its setting being extremely picturesque, and is yearly visited by thousands of tourists.

In succeeding years, construction of the line from Kalgan to Suiyuan proceeded and on May 1, 1921, the railroad was opened as far as Suiyuan, the first train being hauled by one of the Baldwin locomotives herein described, of which 17 are now owned by the Railway, four having been purchased in 1910, three in 1919 and ten in 1920.

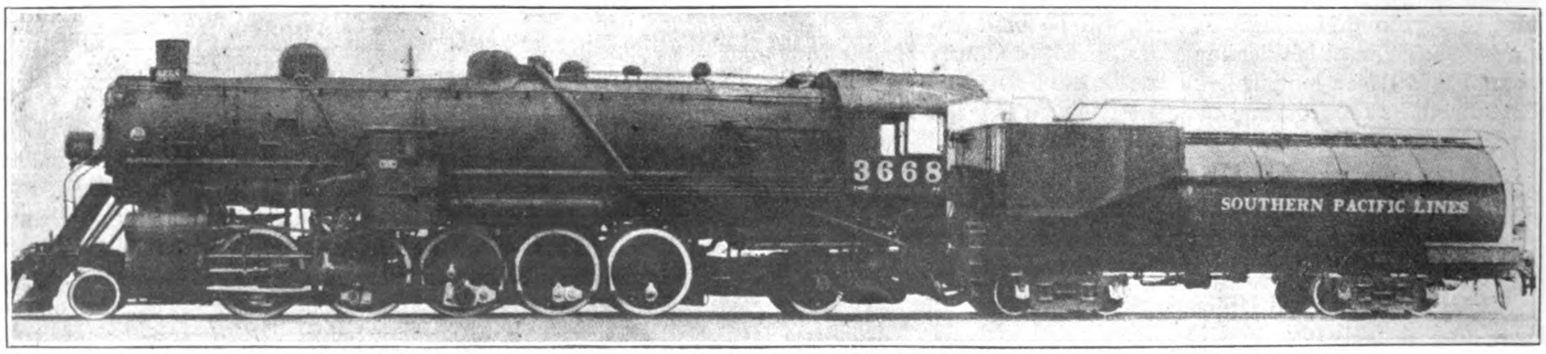
Locomotives of this type are peculiarly adapted for switching, general utility and construction service, being a self-contained unit and having a short rigid wheel-base which, combined with the guiding and supporting features of front and rear trucks, makes the locomotive safe to operate in either direction on light rails and over short radius curves.

The photograph herewith shows one of the ten locomotives which were ordered in May, 1920, with a request for early shipment. In October of the same year the engines were on their way to China.

These locomotives are designed for ruling grades of one per cent. and have a straight top boiler and a steel firebox. The piston valves are actuated by Stephenson valve motion and controlled by a screw reverse gear. The brakes are of the Baldwin steam type schedule U. 6. In common with the practice on Chinese Government Railways, M. C. B. automatic couplers are employed. Other special equipment includes Coale safety valves, Ashcroft steam gauges, Baldwin water gauges, Monitor injectors, oil headlights and Nathan double bulls-eye lubricators.

Gauge	4′ $8\frac{1}{2}$″
Cylinders	16″ × 24″
Valves	Balanced
Boiler	
Type	Straight top
Diameter	50″
Thickness of barrel sheets	$\frac{1}{2}$″ 9/16″
Working pressure ..	180-lbs.
Fuel	Soft coal
Firebox	
Material	Steel
Staying	Radial
Length	$60\frac{7}{16}$″
Width	$34\frac{3}{8}$″
Depth, front	$57\frac{1}{8}$″
„ back	53″
Thickness of sheets, sides .	$\frac{5}{16}$″
„ „ „ back	$\frac{3}{16}$″
„ „ „ crown	$\frac{3}{8}$″
„ „ „ tube	$\frac{1}{2}$″
Water Space	
Front	4″
Sides	3″
Back	3″
Tubes	
Diameter	2″
Material	Steel
Thickness	No. 12 W. G.
Number	152
Length	13′ $6\frac{1}{2}$″

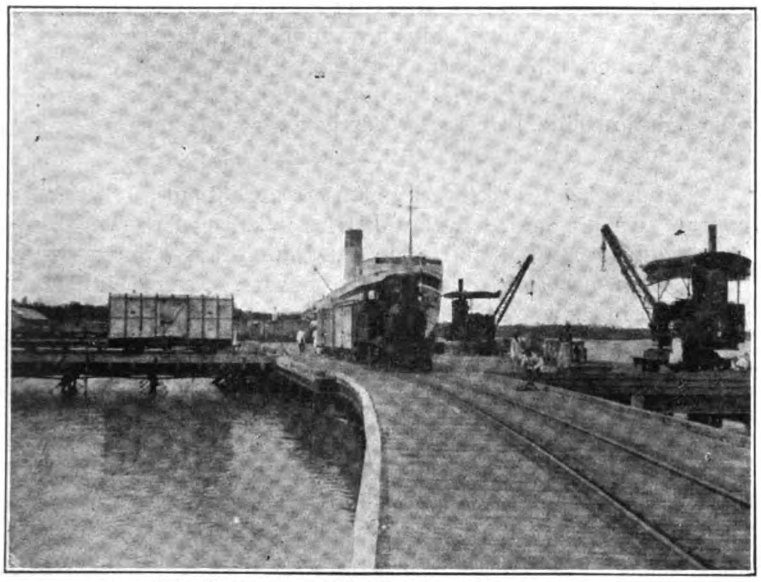
Heating Surface	
Firebox	90 sq. ft.
Tubes	1,071 sq. ft.
Total	1,161 sq. ft.
Grate area	14.4 sq. ft.
Driving Wheels	
Diameter, outside ..	44″
„ centre ..	38″
Journals, main ..	7″ × 8″
„ others ..	7″ × 8″
Engine Truck Wheels	
Diameter, front ..	28″
Journals..	$4\frac{1}{4}$″ × $7\frac{1}{2}$″
Diameter, back.. ..	28″
Journals	$4\frac{1}{4}$″ × $7\frac{1}{2}$″
Wheel Base	
Driving	10′ 0″
Rigid	10′ 0″
Total engine	25′ 9″
Weight	
On driving wheels ..	87,850-lbs.
On truck, front ..	11,250-lbs.
„ „ back ..	14,000-lbs.
Total engine ..	113,100-lbs.
Tank capacity ..	1,600 U.S. gals.
Fuel	5,000-lbs.
Service	Switching



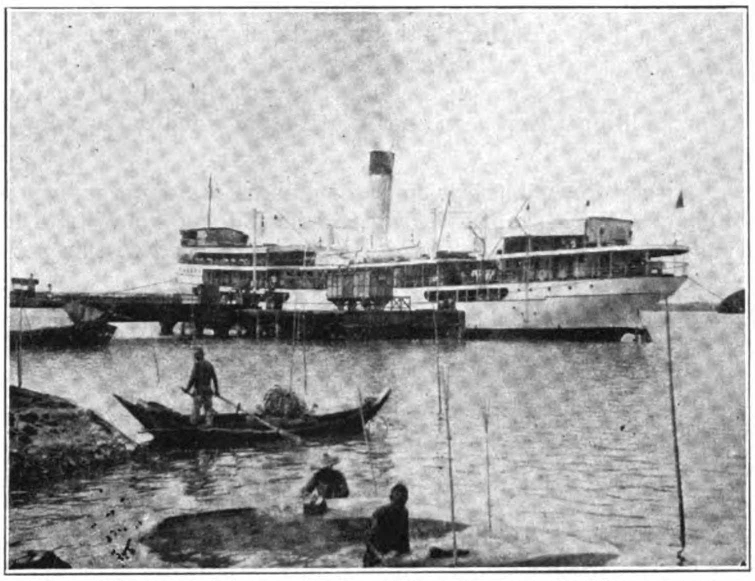
Fifty of these Santa Fe Type Locomotives Just Built by The Baldwin Locomotive Works for the Southern Pacific Lines

Building Ports in Malaya

By L. G. Blochman



The Deep-water Wharf at Port Swettenham



One of the three Wharves for Coastwise Vessels at Port Swettenham

ALTHOUGH the tin and rubber slump has temporarily caused a retrenchment of many development schemes and has forced an economy of both passenger and freight trains service on all lines, the Federated Malay States railways are going ahead with two major projects calling for an expenditure of close to $32,000,000 Straits currency.

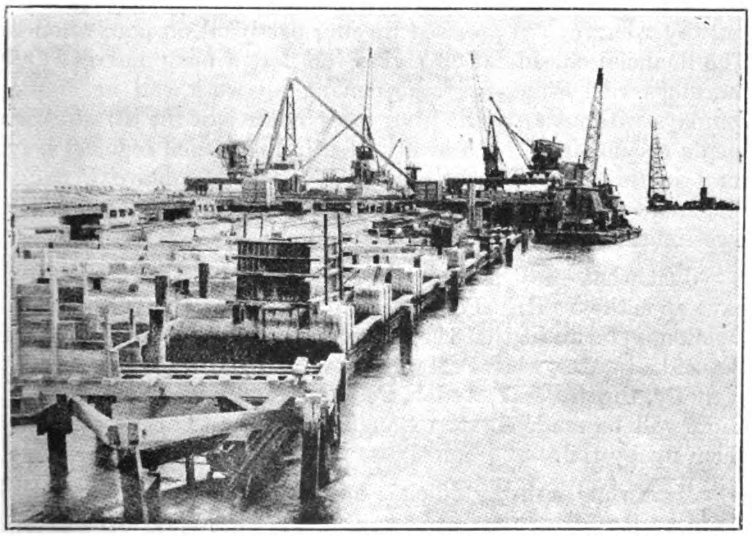
Curiously enough, neither of the projects is in the F.M.S. proper. One is the construction of a causeway bridging the straits between Johore Bahru, in the independent state of Johore, and Woodlands, on the island of Singapore, Straits Settlements. The other is known as the Prai scheme, and consists in making a deep-water port at Prai, opposite Penang on the mainland of Province Wellesley, Straits Settlements.

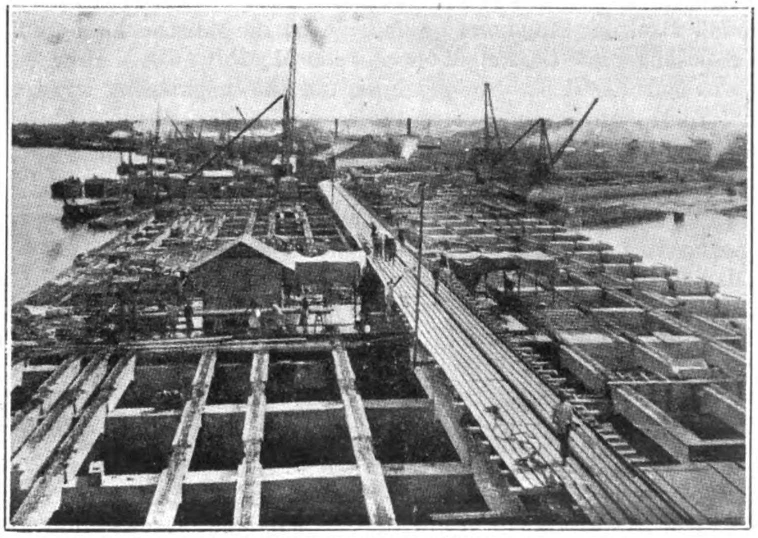
The completed Prai scheme will cost $21,450,000, it is estimated. Of this amount approximately $1,500,000 has gone into doubling the line between Prai and Butkit Mertajam, where the railway branches into two lines, one leading north to Bangkok and the other south to Ipoh, Kuala Lumpur and Singapore. The increased trackage has already been laid, and will take care of the congestion that is expected when the port area begins to feel the traffic resulting from the opening of the deep-water wharves and warehouses.

At present, both ocean-going and coastwise steamers anchor in the roads between Penang and Prai and discharge their cargo into *tongkangs* whence it is taken either to Penang or Prai for re-shipment. The P. & O. wharf at Penang is the only one in the vicinity. When the railways' scheme is completed, liners may come alongside the docks and discharge directly into railway cars, or into warehouses which are also being erected.

The channel of the Prai river is being used for a basis of construction work. The river is being dredged to a depth of 30-ft. at dead low water for a distance of a mile from its mouth. The average width of the channel will be 500 feet, with an additional width opposite the docks, allowing room for vessels to turn without difficulty.

The new deep water docks are being built on the south bank at the mouth of the river. When finished they will afford 1,100 feet of wharfage, and will contain two godowns, each 475-ft. by 65-ft. Adjoining these docks are the present coastwise docks, 600 feet long, which are being widened and fitted with a godown of dimen-





CONSTRUCTION OF NEW WHARVES AT PRAI, BY THE F.M.S. RAILWAY DEPARTMENT

sions 375 by 65-ft. With the dredging completed, this wharfage will also be available for ocean-going shipping, giving in all 1,700 feet of deep-water docks for general shipping. Directly adjoining this dock, will be a coal wharf 900 long with full bunker accommodations. Both domestic coal from the Malayan collieries in Selangor, and imported coal for those ships desiring a different grade, will be available here.

Beyond the coal wharf is the present railway yard, with engine and carriage sheds, station, and jetty for the steam-launch service between Prai and Penang. Behind the yard will be built quarters for the additional European and Asiatic staff which the opening of the port will require.

Further down the river on the same bank is a large mangrove swamp which will be sufficiently reclaimed to provide a site for drydocks and slipways. The river will be dredged to this point to give access to these ways by large ships.

On the opposite side of the new wharf from the deep-water dockage, a lagoon will be dredged to a depth of 16 feet at low water, giving a harbor space of 300 by 1,100 feet. This lagoon will be given over to ships of light draft, and four 100-foot docks will be built at the south side. Behind these docks will be eight godowns, two to a dock, measuring 400 by 65 feet.

Behind the godowns, on land that will be made available by deviating the course of a small stream, there will be set aside one-acre blocks for factory sites, or sites for any other industrial purposes which may present themselves when the port is fully developed.

On the north bank at the mouth of the river 250,000 square yards of mangrove swamp will be reclaimed. No definite use has been yet assigned to the land which will be made available for this project, known as the Bagan Luar Reclamation.

The work on the Prai scheme was begun in May, 1918, and will be completed by the end of 1924. Some of the docks will be finished before the final date, and railway officials expect to have some deep-water wharfage, completely equipped with tracks and steam cranes, open to traffic by the end of next year.

The contract for the Prai wharves is in the hands of Messrs. Topham, Jones & Railton, Ltd., of London. Construction is being supervised by Messrs. Coode, Matthews, Fitzmaurice & Wilson, London, consulting engineers for the F.M.S. Railways, who are responsible for the plans and specifications.

The completion of the Prai docks will make two ports that the railways have built on the peninsula. The enterprise of the F.M.S. government made Port Swettenham, chief port for Selangor, into a port of entry taking care of 175 ships a year from Europe and America. The development of Port Swettenham is an accomplishment which would never have been undertaken by a private railroad company. From the standpoint of business, it would be more advantageous to have goods intended for the central Malay states landed at either Singapore or Penang, as the railroad haul would thus be longer and the freight charges considerably more. However, it was considered best for Selanger and the neighboring territory that there be a going port at the mouth of the Klang river, 25 miles from Kuala Lumpur.

Until 1899, Klang town was the port for Selangor, and coastwise shipping from Singapore and Penang used to come five miles up the river to a small dock which has since disappeared. In 1899 the F.M.S. Railways extended their Kuala Lumpur-Klang branch to Port Swettenham, and wharves were built to take care of the coast shipping which was diverted from Klang. In 1913 work was begun on a series of wharves which made Port Swettenham a deep-water harbor, and in 1918 the first ocean-going ship, a Ben Line steamer, came alongside the new docks.

Three small docks take care of the coastwise shipping at Port Swettenham to-day, and 2,000 feet of deep-water wharves, standing in 32 feet of water at dead low tide, accommodate the ocean-going ships. All docks are equipped with trackage and galvanised-iron godowns, so that cargo may be either loaded directly into freight cars, or stored for future shipment.

Since facilities have been provided, imports from Europe come direct to Port Swettenham without transhipment. A service by the Blue Funnel Line brings shipments direct from the east coast of the United States, and occasional ships from Pacific ports come direct, but a good part of American cargo is still handled twice. The Blue Funnel ships are the most frequent callers at this F.M.S. harbor, P. & O. second, with the Ben Line and the Glen Line close behind. Beside the over-seas carriers, there is considerable Asiatic traffic, principally rice-boats from Rangoon and Bangkok which are regular and frequent callers.

Exports from Port Swettenham are almost entirely rubber and copra. Tin ore mined in the district is shipped to Singapore or Penang for smelting, and exported from these points. Imports range from needles to locomotive boilers. Everything that is consumed in the central Malay states comes through Port Swettenham. All the material for the F.M.S. Railways comes in here, including rolling stock. Much mining equipment is also unloaded for Selangor, Pahang and Lower Perak.

Mr. W. G. Stewart, assistant railway traffic manager in charge of Port Swettenham, is particularly proud of the harbor's facilities for handling heavy shipments. Railway regulations forbid the handling of anything weighing more than 20 tons, but no single pieces have ever come through weigh more than 15 tons. Mr. Stewart tells the story of the first American ship that called after the deep-water docks had been completed :

" She was bringing an American dredge for the Bentong Tin Mines in Pahang, " says Mr. Stewart. " The skipper was a bit worried about getting the dredge off. He wanted a fortnight to discharge, as it had taken him nearly that to load it in San Francisco with a floating crane. He was considerably surprised when we had all the dredge parts on a train headed for Bentong at the end of five days."

The port is fortunately situated in regard to coastwise shipping, as coasters bound from Singapore to Penang or *vice versâ* can put in and spend six or eight daylight hours at work without altering the time of their ultimate arrival had they been making a direct run.

Spending the day loading at Singapore, ships usually leave in the late afternoon. If they made the run continuously, they would arrive at Penang at midnight of the second day. That would have them loafing in the roads for six hours, awaiting daylight. Instead of doing this, they put in at Swettenham, which is overnight from either terminal port and only two miles off the direct course between them, and spend the extra hours loading and discharging whatever cargo they have for the central states.

Port Swettenham is a free port, charging only a pilotage fee. No wharfage is charged. Ships loading or discharging at the railway wharves are assessed 5 cents per picul on goods handled. The financial consideration makes the port a busy one on Sunday mornings. In Singapore and Penang no work can be done on Sundays without a permit from the governor of the Straits Settlements accompanied by a healthy fee. As no such regulation is in force in the F. M. S., ships make it a point to leave Penang or Singapore on a Saturday, and spend Sunday working at Port Swettenham.

Just what effect the opening of a deep-water port at Prai will have upon the traffic at Port Swettenham is a matter for speculation. Opinion seems to be that the Selangor port will retain the trade for the central states, while Prai will handle freight for Penang, Province Wellesly, Upper Perak, Kedah, Perlis, Kelantan, and Siam. A great effort will be made to stop Bangkok shipments at Prai and send them up by rail.

Meanwhile, railway officials even talk of improvements to be made at Port Swettenham in case traffic increases " when rubber and tin go up."

Conservancy Work in China

By Laurence Impey

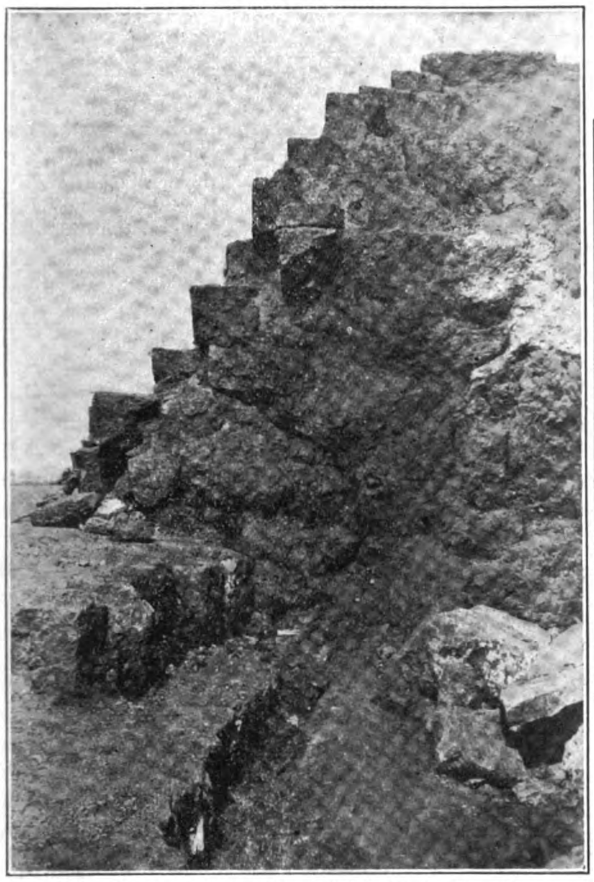
IN the course of our famine relief operations I had occasion to visit the city of Hsiang Yang, where we were carrying out some dyke repair work, and I think a short note on it may prove of interest.

I would like to refer first to an account of Siang Yang written by the famous Italian Marco Polo in the year 1295, when he committed to writing the history of his twenty old years sojourn in China.

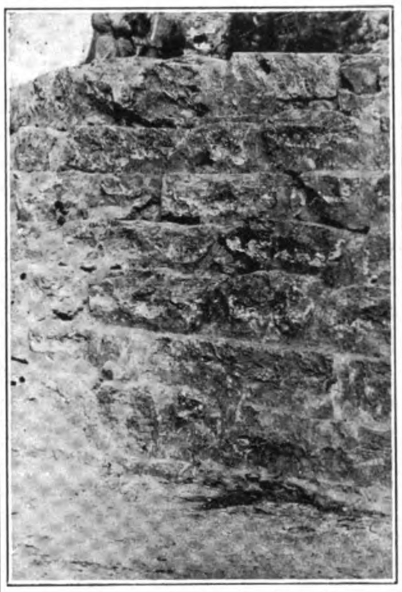
The first shot proved lucky, for it crashed into one of the principal temples with such violence as to destroy it, and bury many of the citizens in its ruins.

Terrified by this occurrence, which they attributed to the vengeance of the gods, the inhabitants made haste to sue for peace.

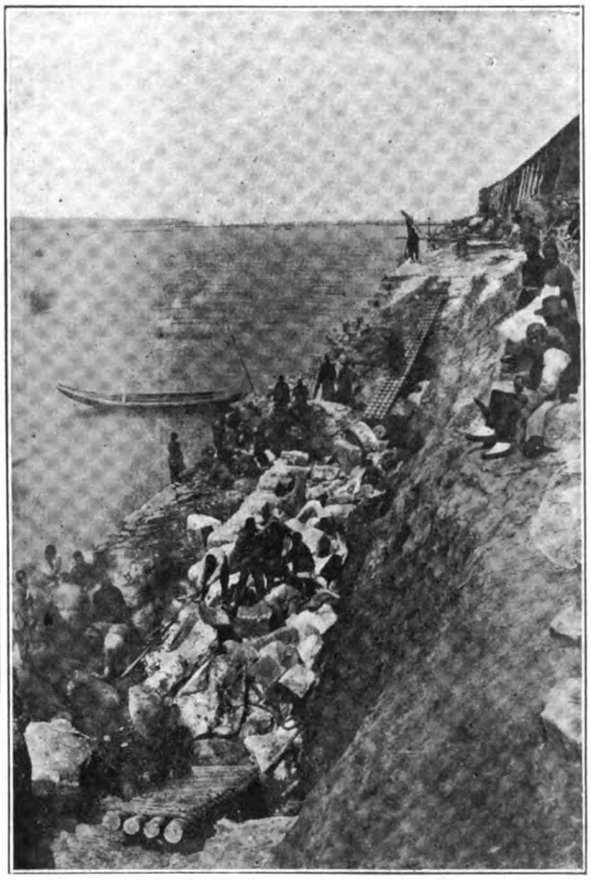
That this account is authentic there can be no doubt, both from the local legends, and from the constructive work shown even in the present day on the water front which we were repairing.



The Massive Stone River Wall Protecting the Ancient City of Hsiang Yang on the Han River



Face View of the Ancient Stone River Wall of the Han River at Hsiang Yang



Repairing the old Hsiang Yang River Protection. The Walls of the City fall sheer to the River

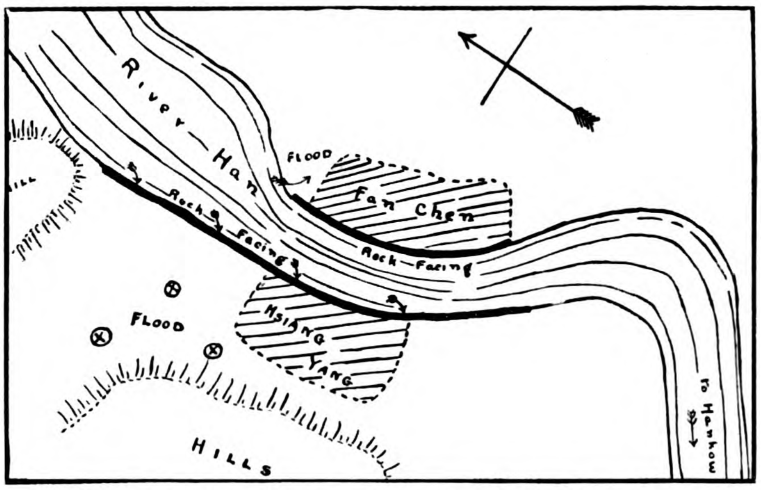
The emperor of the period was the famous Kublai Khan, who was then endeavoring to conquer the southern part of China,. which was still in possession of the old Chinese Sung dynasty.

The city of Hsiang Yang was the key to the situation, and for four years it resisted all attacks.

Nicolo, the father of our historian, was then in residence at the imperial court, and he and his son approached the emperor and proposed to him the construction of 'mangonels' or stone-throwing machines such as were used by the Romans and other ancients in the siege of fortresses.

This proposal met with approval, the more so as all attacks on Hsiang Yang and its sister city across the river had proved useless.

With the aid of certain Nestorian Christians the machines were built and conveyed to the front by rafts, where they were prepared for action.



Han River Conservancy Work at Hsiang Yang

The rock facing is of the most massive nature, the blocks five and six feet in length, and the depth of the work some ten feet in many places, while the river frontage thus protected is over two miles.

Nor is it confined to one side of the river only, for the city of Fen Chen on the opposite side of the stream is similarly protected.

The sectional photo shows the damage done by the floods of last year, which had sufficient force to destroy the work of centuries, and hurl the masses of rocks across country or miles down stream.

The construction as carried out by local contractors under our direction presented some points of interest, notably in the form of cement used.

This grouting is composed of a mixture of lime, earth and a

rice soup, which is poured into the cracks and used as backing, and when dry appears to acquire an extraordinary solidity.

It will not set under water, but seems to be impervious to moisture when set, and is interesting moreover from the fact that it is the same compound as was used by the builders of hundreds of years ago, as far as one can judge.

The illustration shows the work in progress, with the walls of Hsiang Yang falling sheer to the river on the right, and the houses of the modern city of Fan Chen in the left background.

The blocks that we employed were of a fair size, as can be seen, but they were in no way comparable with those of the by-gone times, and it is an interesting comparison between the government of ancient days which was willing and able to devote millions of money to work of public welfare, and the feeble policy of the present day which has to rely on the efforts of outsiders in the shape of famine relief commissions.

Nowadays the city of Hsiang Yang is only the residence of the officials and some of the older gentry, the trade having all been transferred to Fan Chen, where they have the telephone, an aerated waterworks, and other inconveniences.

The river here is some six hundred yards wide, and the danger is due largely to this, as the channel above the cities has a breadth of over a mile, and the consequent constriction of flood water is very great.

The overflow has caused damage at the points indicated with an arrow, and at one time threatened to envelope the city of Fan Chen entirely, while some years ago it actually penetrated behind Hsiang Yang on the hill-slopes as marked by a cross.

It is curious that such an engineering construction should have arisen in some ways, for the builders of old time were fully as perspicacious as those of the present day, and must have foreseen the danger, but it appears that they estimated the risk as being worth it, for the native city of Hankow is placed in just such a position of jeopardy from the constricted area at the confluence of the rivers Han and Yangtze.

One point which I noticed during the construction work, and that was the apparently insecure foundations of this rock bunding, which did not penetrate more than a few feet below water level, and which has no excuse such as a rock foundation upon which to build.

Further experience showed that this is general upon the Han river, and the same may possibly apply to other conservancy construction in other parts of China which I have not seen.

With regard to the footings of the work at Hsiang Yang, the masonry was laid on wooden piles six inches in diameter, and having a penetration of upwards of fifteen feet, which should last for some years, as they are under water and therefore not exposed to destructive wear and tear.

The total cost of repairs carried out amounted to only forty thousand dollars, of which part was on loan, and part was represented by the materials, which were provided by the local and provincial officials on behalf of the authorities.

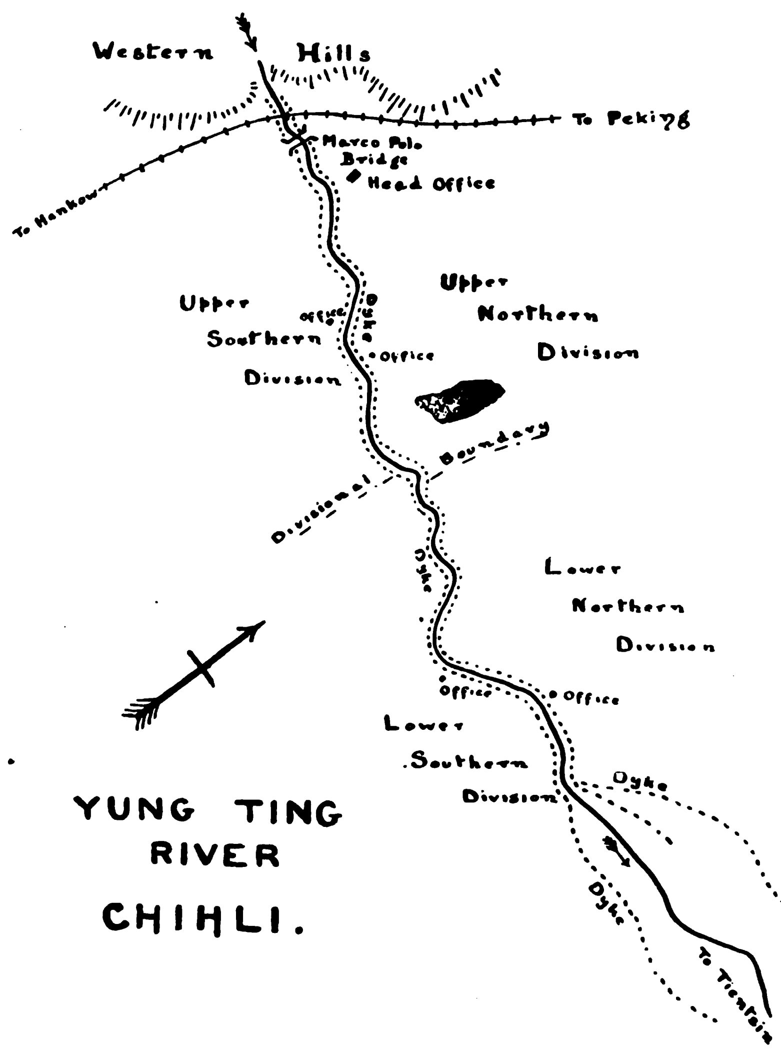
The Yung Ting Ho

The Yung Ting river has its sources in the province of Shansi, and passes thence through the Western Hills, under the shadow of which it runs with ever increasing velocity, gathering sand and gravel as it goes, until it emerges in the neighborhood of Peking at the famous Marco Polo bridge.

Owing to the fact that it is thus confined by hills, the conservancy officials make no attempt to handle the river until it reaches the vicinity of the bridge, and it was at this point that my own observations commenced.

The area covered by the board extends from Marco Polo bridge to the city of Tientsin, a distance of some three hundred *li* on each bank, and they organize the work as follows:—

There are four divisions, the upper north division, the lower north division, the upper south division, and the lower south division, located on the northern and southern banks of the river respectively.



Yung Ting River, Chihli

The divisions are subdivided into sections, five to each division, giving them a length of some twenty *li* or more, a convenient unit of work to cover.

Each section has an engineer, an inspector and two assistants, while at No. 3 section in each division is the divisional engineer.

The head office is at the town of Liu Kow Chiao, near the Marco Polo bridge, and all the sections and divisions are in touch with headquarters by means of a private telephone, so that any danger can be reported immediately.

With regard to the nature of the work, stone facing of the dyke can only be done on No. 1 section of the upper southern and upper northern divisions, owing to the cost of transportation of stone from the quarries in the hills.

The rest of the facing is done in the following manner:—

Large branches of trees are cut, tied with rope at their butt ends, and suspended in the stream on the face of the bank.

Piles of *kaoliang,* tied in bundles, are laid on the river front, in layers five feet thick, and covered with a one-foot layer of earth, the whole being pinned down by twenty-five foot piles.

The bed of the river being shallow there is practically no undermining, and the dyke has a height of only some fifteen feet at most, with the result that this type of brush work seems to answer very satisfactorily.

The chief difficulty lies in the sandy nature of the soil, which cannot be tamped, and also in the fact that the river rises with extreme suddenness, so that at night it may have a channel a hundred yards in width and in the morning this may have swelled to three-quarters of a mile.

The width between dykes varies from half-a-mile to a mile and a half, and the rapid rise and fall of the stream renders it necessary to watch the doings of the river with particular care, in order that a few hours warning may be given at threatened points.

The bed of the river lies some ten feet above the surrounding country, but I should suppose that the sedimentary and sandy nature of the flood tides renders the use of water gates for irrigation purposes impossible.

It appeared that the construction work was fairly well carried out, though I do not think that any full estimates of work required are prepared, the job that threatens danger being attended to as it comes along, and the materials in the various areas being bought more or less on speculation, as I observed that continued exposure to the weather had considerably deteriorated the quality of the ropes, *kaoliang*, brushwood, piles, etc.

It was not until I began to investigate the financial conditions and the personnel that I realized that I was indeed in China.

Each section has four on the staff, five sections to a division, plus the divisional engineer, yet the payroll for the whole division was only $624 per month, an allowance of $30 per engineer.

How can honesty and a straight policy be expected under these circumstances, for it is obvious that no one can live on such an allowance.

Then I found that each division carried a permanent laboring staff also, at a monthly rate of something under $400.

This seemed a reasonable idea, until it transpired that there were two hundred and fifty on the payroll, an average of a little more than a dollar and a half per month.

It was explained that the men were allowed to go about their farming when not needed, and that when they were needed their food was provided on the job, and that they were supposed to have certain rights of cultivation of conservancy land.

This appears a most unsatisfactory system from a western point of view, as it renders it extremely difficult to check up expenditures, calls for a payment to unnecessary men at slack times, and does not cover the number required in an emergency.

The work is being done, and not neglected, as is the case on some other rivers, while when one considers that the staff is seven months in arrears of pay the honesty of the staff in carrying out their work is rather surprising and certainly very creditable to all concerned.

The Manila Railway Company

THE annual report for the year ending December 31st, 1921, shows a total length of road in operation of 1,031,549 kilometres (of which 13,586 is double track) with 21.99 kilometres under construction. The equipment shows 35 passenger, 49 freight and 71 combination locomotives, a total of 155, with 197 passenger coaches and 52 baggage and express cars, and a total of 1,831 freight cars of all classes.

The income account statement for the year is as follows :

Operating Income	Year 1920. Pesos	Year 1921. Pesos
Railway operating revenues :		
Transportation—rail line ..	11,568,011.95	11,978,509.32
Transportation—water line ..	267,294.73	192,484.52
Incidental	131,093.82	103,304.85
Non-operating Income		
Hire of freight cars	1,713.92	1,566.57
Rent from locomotives	2,251.00	484.25
Rent from lease of road	—	—
Miscellaneous rent income	8,219.65	3,577.72
Dividend income	—	—
Income from funded securities ..	4,337.00	2,190.88
Income from unfunded securities ..	327,658.11	203,178.27
Miscellaneous income	6,385.75	2,976.27
Total	12,316,992.93	12,488,272.65
Operating Expenses		
Railway operating expenses :		
Maintenance of way and structures	2,160,627.13	2,013,172.54
Maintenance of equipment ..	838,815.34	1,085,923.78
Depreciation of equipment ..	349,875.88	393,887.95
Traffic	39,444.16	48,270.23
Transportation—rail line ..	5,738,660.09	5,217,868.59
Transportation—water line ..	289,954.96	280,672.85
General	507,569.41	632,513.80
General	507,569.41	632,513.08
Transportation for investment ..	(58,830.48)	(165,502.62
Other railway operating expenses :		
Railway tax accruals	8,078.36	—
Uncollectible railway revenues ..	126.37	262.85

Deduction from Gross Income	Year 1920. Pesos	Year 1921. Pesos
Hire of freight cars	—	103.95
Interest on funded debt	2,430,800.00	2,572,877.38
Interest on unfunded debt.. ..	68,000.77	140,839.80
Income applied to sinking and other reserve fund	4,488.00	4,488.00
Total	12,377,609.99	12,225,379.10
Balance transferred to profit and loss	(60,617.06)	262,893.55

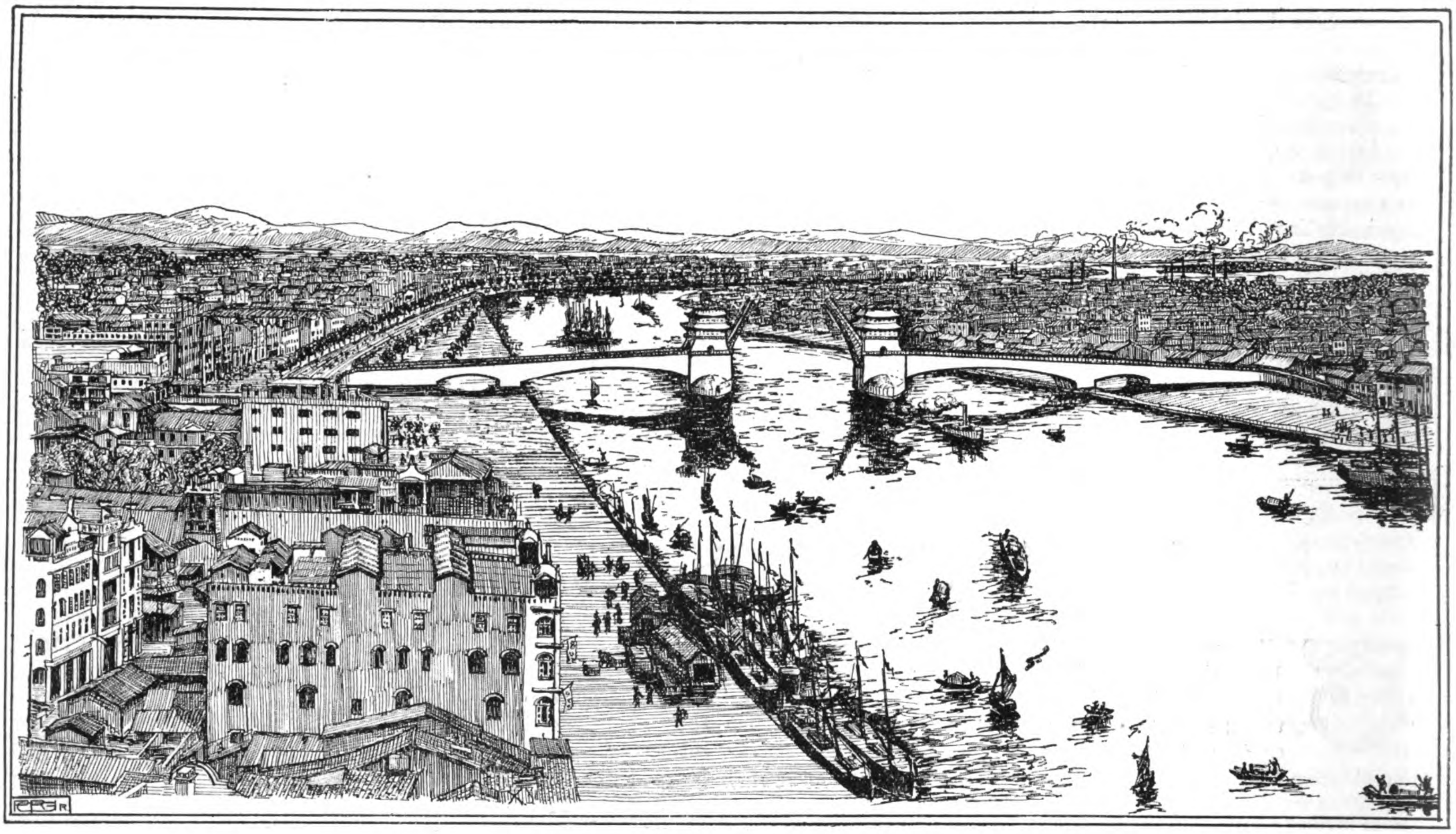
Express receipts declined slightly due to financial stringency and the loss of business to auto-trucks on short hauls. Train messenger service established during 1919 is becoming more efficient and attractive to shippers.

The directors recommend that the express service be expanded and made to cover C. O. D. business which will facilitate provincial producers in reaching the larger markets as well as increase the distribution of manufactured articles. The possibility of establishing delivery trucks in the Manila district should also receive careful consideration.

The opening of the Ragay gulf route following the completion of the rail lines from Calauag to Aloneros and from Naga to Pamplona during the latter part of 1921, and placing the steamship *Borongan* in operation between Aloneros and Pasacao will undoubtedly prove attractive, especially to the Bicol provinces. A through passenger, freight and express service is being maintained and is proving beneficial to the Legaspi division earnings.

The train service between Noveleta and San Roque, province of Cavite having been abandoned under legislative authority, and the rails removed, an auto-truck service was established, owned and operated by this Company. The first truck was placed in operation during March, 1921, and another truck was added during May. The trucks to the end of December handled 49,170 passengers with receipts of P.9,834 and expenses of P.10,212.98 which does not include depreciation and interest on the investment. The present rate of fare is 20 centavos which should be increased.

Auto-truck competition has increased at an alarming rate during the year, especially in the districts adjacent to Manila. The lack of supervision over auto trucks by the public utility commission makes the competition extremely severe and this competition can be met only by reducing the fares or providing more frequent and cheaper railroad transportation. This can probably be accomplished by installing on designated rail lines motor propelled coaches.



Proposed Bridge Across the Pearl River

THE following project for a bridge to connect Canton city proper with Honam island has been worked out in connection with a plan for improving the front reach in the Pearl river by Major G. W. Olivecrona, engineer-in-chief to the board of conservancy works of Kwangtung.

The question as to whether this bridge should be constructed as a high-level one providing clearance for vessels with masts, or as one of low-level with a movable span, has been discussed for some time by the public as well as in engineering circles. A low-level bridge with a bascule span has been considered to be the most suitable type in this case for the following reasons :—

1. The future extension of the Canton harbor will follow the shores of the back reach where deep water is to be found. Ocean-going masted vessels which can enter the harbor only through this reach will, with very few exceptions, moor here and never have to pass the bridge.
2. The approaches to the bridge would be limited each to 232 m. in length as compared with a length of 580 m. respectively, if a high-level bridge were chosen. The low bridge would, therefore, avoid the occupation of valuable private land, as the approaches could be laid out on ground reclaimed from the river.
3. The bridge would have a free height at high water level of 14 m. under the bascule span and would thus permit local river steamers, tugboats and all smaller craft to pass without necessitating the opening of the bascules.
4. A low-level bridge of heavy substantial structure, built of reinforced concrete would be more in keeping with the surroundings, compared with a high-level bridge which would have to be constructed of iron trusses, built to a height of about 27 m. above H.W.L.
5. A low-level bridge constructed of reinforced concrete for which all materials, with the exception of the movable span, could be obtained locally, would eliminate the necessity of buying expensive materials from abroad.

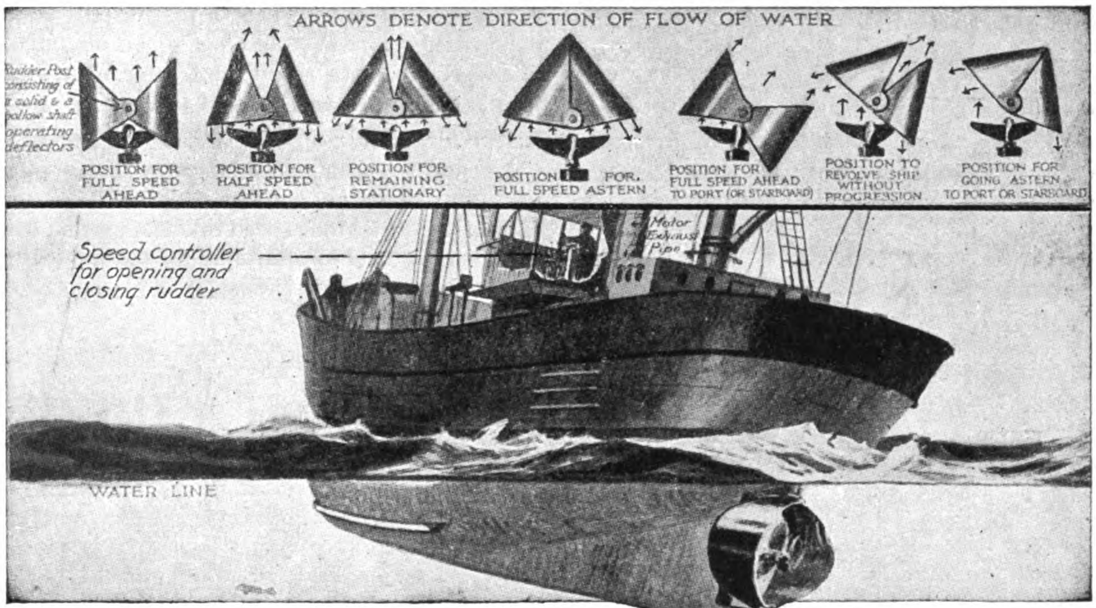
Those who oppose the construction of a low-level bridge argue that the movable span when in operation would put a complete stop to all traffic over the bridge. This is of course true, but if the periods for the opening of the bascules should be selected during the nights and early mornings when the flow of traffic is at its lowest, the inconvenience would not be much felt. With modern construction and appropriate machinery, the time for opening or closing the leaves would only cover a period of a few minutes.

The specifications for the bridge have been proposed as follows : Number of spans three, two of which are to be stationary, and to have a free opening of 59 m. from pier to shore and a height in the centre of 11 m. at H.W.L. The third span is to be movable in accordance with the bascule type, with a free opening of 45 m. between the central supporting piers, and a height in the centre of 14 m. at H.W.L. The width of the bridge between side railings should be 18 m. The price has been estimated to cost H.K. $2,-160,000. This includes the cost for the deepening of the river at the selected site for the bridge.

Kitchen's Reversing Rudders

It is a remarkable fact that with all the wonderful scientific improvements which have been embodied in the construction of the modern power-driven ship, the type of rudder in use to-day is practically the same as in the days of the Vikings. It is true that inventors have from time to time evolved various forms of ships' rudders, with the object of improving the steering and manœuvring capacity of the ship, and some have also aimed at obtaining a braking effect by means of the rudder, but the only invention which so far has proven itself a success and has completely satisfied commercial requirements, is the ingenious rudder designed and patented by Mr. J. G. Kitchen, of Lancaster, England.

This invention gives all the advantages previously sought for, with the important addition of the power of bringing the vessel to a dead stop or of reversing the direction of the course without altering the speed or direction of the engine or propeller. In other words, Kitchen's reversing rudder is capable of manœuvring and reversing the direction of a ship from the bridge, without reference to engine-room. This is a most important safety factor and should appeal to all practical men, as it will have an important bearing upon future navigation. It is also most important to remember that the control of the helm is in exactly the same way as with an ordinary rudder by steering wheel or tiller and that therefore the present invention is not likely to create any confusion in the wheel-house. A separate and independent hand wheel is provided by means of which all speed variations and reversing is carried out.



This wheel corresponds to the operation of the old-fashioned gong and jingle or bridge to engine-room telegraph with the very important difference that with Kitchen's rudder immediate and direct action is obtained whereas in the other the older from only indirect and much delayed action is obtained a delay which might result in serious consequences.

The action of Kitchen's reversing rudder is such that the direction of thrust never changes, whether the vessel is going ahead or astern, consequently the excessive vibrations and wear and tear, which are unavoidable under ordinary conditions of reversing, disappear entirely when Kitchen's reversing rudder is used.

The essential parts consist of two curved deflectors which partly enclose the propeller. Both deflectors are pivoted at the top and bottom on common centres. One of the deflectors is operated by a solid shaft, and the other by a hollow shaft concentric with the solid shaft. By simple mechanism the deflectors or rudders are made to turn together in the same direction, or equally in opposite directions.

The diagrams show that this rudder gives at all times direct and instantaneous control of the speed and course of the vessel. The engines continue to run at full speed ahead or at their most economical speed while the vessel slows down, stops, goes astern or carries out any other manœuvre required in an emergency or in the ordinary course of navigation.

It has been found that a vessel can be turned on its own centre without proceeding either ahead or astern and when going full speed ahead can be stopped in approximately its own length the time taken depending partly on the rapidity with which the rudder is closed and partly on the ratio of power to displacement.

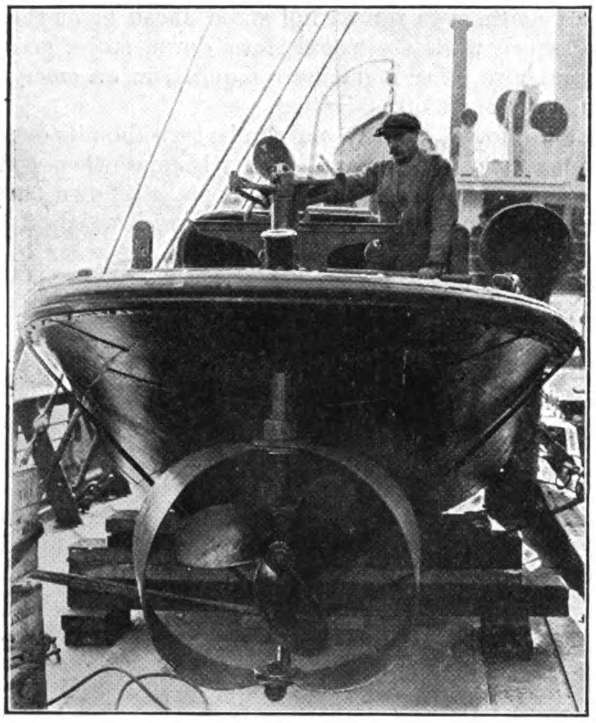
The rudder is applicable to all classes of vessels single of twin-screw and is controlled either by lever, tiller or steering wheel. An indicator is provided showing position of the rudders for speed variations. For large installations it is necessary to introduce power for the steering and operating of the rudders and power operated gears and controls have been designed for either steam, hydraulic or electric.

The Kitchen's reversing rudder was recently fitted to the Spanish coasting vessel the *Alca*, a steel vessel of 500 tons' displacement, 140-ft. long, 22-ft. 5-in. beam and 10-ft. moulded depth fitted with 150 B.H.P. Sulzer Diesel engines but without reversing gear or clutch devices of any kind. The propeller of the vessel is 4-ft. in diameter.

The opening and closing of the rudder and consequently all speed variations and reversing are regulated from the control hand wheel placed in wheel-house and these operations are, of course, quite independent from the control of the helm which is as with on ordinary rudder maintained by steering wheel. The time taken to bring the vessel from full speed ahead to dead stop is 34 seconds and the distance traveled 200-ft. The diameter of her turning circle at full speed ahead was 140-ft. as the time taken to spin about an axis amidships through a half circle was 1 minute 25 seconds. Although the sea speed of the vessel is only 6¼ knots the control proved very efficient and rapid in operation and the boat performed complicated manœuvres with ease.

With the growing demand for internal combustion engines for marine propulsion many difficulties have to be overcome arising out of the high speed of these engines. The problem of slow running and quick and efficient reversing have for a considerable time been engaging the attention of experts as it is generally accepted that reversing directly by the engine or by reversing gear is mechanically objectionable causing abnormal shocks and stresses in the machinery and to the structure of the vessel, excessive vibration and consequently heavy wear and tear on hull and machinery. This difficulty is entirely overcome by Kitchen's reversing rudder, as no reversing gear or clutch of any kind need be fitted. One man can easily run and control the ordinary motor boat because when once the engines have been started he need not leave the steering wheel, but can obtain all speed variations or reverse the course of

the boat, by means of a control wheel within easy reach giving immediate and direct action on the rudder. This means, of course,



improved engine efficiency and economy, reduced wear and tear on hull and machinery, and improved steering and manœuvring qualities.

A further very important factor is also the protection this rudder affords to the propellers and the saving in machinery space as no reversing gear is required. The machinery need only consist of engines, shafting, thrust bearing and propeller, the latter being solidly connected with the engine.

It is often necessary, as for instance, with trawlers and fishing boats to maintain a slow but efficient speed and it is not practicable to slow down on oil engine sufficiently.

With Kitchen's rudder the speed of the boat may be controlled and regulated from the steering position to a fraction of a knot with the engines running at their most economical or lowest reliable speed. The rudders also afford complete protection to the nets from any entanglement with the propeller. It is of very great value with oil engines to be able to run them for long periods at a constant speed thereby reducing to a minimum engine trouble and breakdowns.

The Kitchen's reversing rudder shows to best advantage when applied to tugs and canal boats when quick response to the helm combined with perfect and instantaneous control of speed reduces to a minimum all dangers of manœuvring in congested waterways and avoids any sudden pull on the tow rope which might cause breakage. The power may be accelerated from rest as gradually as may be desired allowing the vessel to proceed at the lowest possible speed and to remain under perfect control all the time.

The Kitchen reversing rudder has also proved itself very successful in launches used on the west coast of Africa where inexperienced native labor has to be employed for running these launches with the result that prior to fitting Kitchen's reversing rudders the wear and tear on the engine and reversing gear were excessive owing to lack and skill on the part of the natives.

Since Kitchen's reversing rudder has been accepted the native engineer's duty practically resolves itself to keeping his engine running at a constant speed in one direction while the steersman has complete control of the speed and manœuvring of the boat independently of the engine.

Peking Electric Tramway

(Schedule of Progress of Work for 1922-1923)

From the time the Company was organized to August 1922, the following work has been done :—Survey of lines. Completion of drawings of lines.

Contracts for purchase of materials.

First payment of contract. Call for tenders of power station, converter station, car-shed and repair shop buildings. Testing of reinforced concrete trolley poles.

From August 15 *to* 30.—Construction of poles. Testing of water source for power station.

From September 1 *to* 30.—Arrival of boiler and principal machinery foundation plans. Opening of tenders of power station, converter station, car-shed and repair shop buildings. Call for tenders of ballast for road bed. Construction of car body (at Company's shop).

October 1.—Construction of power station, converter station, car-shed and repair shop building begin. Opening of tenders of ballast. Erection of trolley poles begins.

October 30.—Arrival of first lot of 1,100 tons steel rail.

November 1.—Transportation of ballast begins.

November 30.—Second lot of 1,600 tons steel rail arrive.

December 1.—Machine shop equipment arrive.

December 15.—Construction of building stops.

December 31.—Forge shop equipments arrive. Crane and miscellaneous equipment arrive. Boilers and parts of electric machinery arrive. Preparation of traffic regulations.

January 15, 1923.—Paint shop equipments arrive.

February 1.—Training of motormen. Upper frames of truck arrive. Laying of track begin.

March 1.—Building construction resumed.

March 15.—Complete arrival of boilers and electric machinery and accessories. Erection of boiler and piping begins. Part of truck shipment arrive. Assembling of car body and truck begins.

March 31.—Erection of turbine started. Remaining portion of steel received.

April 15.—Erection and connection of switchboard. Winding shop equipment arrive. Repair shop transmission and shafting arrive. Erection of repair shop machinery. Trolley wires arrive.

May 1.—Transformers and accessories arrive. Erection of converters. Stringing of wires started.

May 15.—Delivery of truck completed.

May 31.—Erection of poles and car bodies finished.

June 30.—Construction of power station, car-shed buildings finished. Track laying finished.

Tramways for Kowloon. A correspondent at Hongkong of "The Times Trade Supplement" writes : The government appear to have decided to sanction the construction of tramways in Kowloon. To begin with about seven or eight miles of track will be laid, but Kowloon is spreading so rapidly that it will not be long before there will be twenty to thirty miles of track once a beginning is made. The plan favored at present is that of leasing the concession. Whatever arrangements are made, one result will be more work for British engineering firms.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, SEPTEMBER, 1922.

Facing the Facts

> **"If the Chinese government without aid from the outside could not or would not save China, then the great powers in common would be compelled to take united action to aid in saving her. With an anarchic or impotent China before them the powers could not pass by on the other side. That was too vast a menace, not only to their own interests, but to the peace of the world."**
>
> *(From Minister Schurman's Speech at Peking, September, 1921)*

THE Chinese people need a friend. Their government is defunct. Anarchy reigns throughout the provinces. There is no responsible head to any ministry. One man stands at his post fighting the inevitable. The minister of foreign affairs still officiates, receiving protests, complaints, demands, bills and abuse from the diplomats of all other nations.

The fears expressed by pessimists have come true. China has refused to put her house in order. She has failed to abolish civil strife and develop a stable and effective government acceptable to her own people as well as foreign nations. She stands a menace to herself, to her neighbors and the peace of the world. Her weakness and disorganization has permitted the Soviet to establish its rule in Mongolia and her scholars are now sitting at the feet of the high priest of Bolshevism addressing him as "Master." Her failure to meet the interest and principal on outstanding loans has destroyed her credit abroad. Her refusal to pay legitimate bills to private merchants for materials ordered and delivered threatens the stability of many of the largest foreign concerns in China.

Dr. Wang Chung-hui, Acting Premier of the Chinese Government

Dr. Wellington Koo, China's Minister of Foreign Affairs

In the darkest hour of China's financial troubles, the burden of staving off bankruptcy is thrown on the shoulders of these leaders of the Young China party.

The Peking government has lost the confidence of its own bankers and investors, closing the door to any further assistance from within. It has played false to its friends and hypothecated over and over again revenues previously set aside for the service of other loans. The salt surplus is but a tradition, and it is said that the gabelle faces a deficit of over $2,000,000 for the current month. Peking officials have defaulted, absconded, forged and stolen in order to keep the gang of militarists in power. They have printed unauthorized domestic loan bonds and sold them to an unsuspecting public. Not content with fleecing their own people they have attempted to swindle the foreigner by using these forged notes as security for advances. In one instance, the vice-minister of finance actually succeeded in raising $400,000 from a foreign bank on the security of $575,000 worth of these spurious bonds. Luckily, the manager of the bank had the wit to make an immediate investigation and discovering that the numbers on the bonds were unauthorized, stopped payment on the compradore order. It had been already cashed at a native bank.

Story after story is told of other lapses from official honesty on the part of Peking job-holders forced into crime in order to satisfy the greed of their military overlords, or, in many cases, to fill their own pockets while the filling was good. The foreigner has been milked, bilked, stung and trimmed at every turn. Over two hundred thousand dollars in squeeze were extracted in one painless operation from foreign firms in Peking in exchange for forged orders for railway materials placed through a foreign bank, which were at once repudiated by the managing director of the railway concerned. The Peking mandarins have stooped to trafficing in human misery, appropriating relief funds contributed by foreign charity for feeding the starving millions of the North. Roads built from the proceeds of these famine funds are now impassible. The millions expended upon their construction have been wasted. All loans not secured upon the customs and salt revenues may be said to be worthless, a charge upon the good faith and integrity of the Chinese people.

Aside altogether from the many defaulted foreign and domestic loans there exist the more immediate debts owed to foreign mercantile firms in China who are hard pressed to meet their obligations through the refusal of the Chinese authorities to pay up or even consider the matter of issuing bonds or treasury notes that could be used to satisfy the carrying banks. Millions of dollars' worth of materials have been delivered in fulfillment of official contracts, and as many more millions' worth of materials are piled up at the ports awaiting payment and acceptance. Large orders have been placed by official intermediaries, the squeeze collected, and on the arrival of the cargo, the intermediary has disappeared, and the officials have repudiated the contract. A list of the foreign firms who have been hit the hardest would embrace many of the most important hongs in China. Owing to a natural disinclination to court publicity, it is difficult to make an accurate estimate of the amounts due to these concerns, but it is safe to state that not less than $40,000,000 is involved. Some of these accounts for railway materials run as high as ten million each. Shipments ordered last year are piled up at the ports where the firms who executed the orders have been compelled to rent land for storage purposes and surround it with armed guards.

Unless these unsecured debts are paid within a reasonable time, foreign firms in China can prepare for another catastrophe before which the crash of 1920 will appear insignificant. The market has never recovered from that break, and another blow at this time may precipitate the failure of firms who have gallantly weathered the

storm relying on the traditional honor of the Chinese to pay their accounts in full. When, two years ago, the Nishihara loans to the extent of over $200,000,000 were repudiated by Peking, the anti-Japanese element applauded this act as highly patriotic, evidence that China still possessed considerable virility and courage. China was being taught how easy it could be done, and to-day the shoe is on the other foot. The other fellow's ox has been gored, and American and British firms are paying the penalty for their blind faith in the *bona-fides* of the Peking mandarinate.

As far as this pertains to American firms, we hold to the conviction that they are not solely to blame. The fault lies with those responsible for initiating the campaign that induced American firms to rush into the new commercial *eldorado* in order to capture the trade by sheer weight of numbers. It is necessary at this time to emphasize these activities, as they constitute a precedent that compromises the American government to take effective steps to protect the interests of those who accepted its advice. There was a time, under a previous administration, when appealed to for protection to American lives and properties in Mexico, a secretary of state could safely answer: "The American government has many more important matters to attend to than bothering about Americans who could not make a living in their own country." Americans were not officially invited to colonize, develop and invest in Mexico, or other countries. They *were* officially urged to come to China. The American government therefore cannot escape its responsibility. The present administration must accept the obligations imposed upon it by the policy of its predecessor, and stand firmly behind its traders who entered the Chinese field and extended credit to a government they were taught to believe could "pay spot cash for everything it purchased, if it so desired."

If American firms are forced into bankruptcy by reason of the failure of the Chinese government to pay its debts for merchandise and materials, or because of its unwillingness to issue notes in order to enable its creditors to seek relief from the carrying banks, the effect upon China will be disastrous. The loss of American sympathy, support and credit may well lead to foreign intervention in the collection of China's revenues, at least, such of these as may be most readily collectable. Americans have learned well their lesson, but we repeat, the government must stand its full share of the responsibility and exert itself by taking active steps in initiating some measure that will bring order out of chaos and stability out of insolvency. Aside altogether from the more important phases of the political situation, it owes that much to its own nationals. It also owes something to the other powers, who have accepted the Hay doctrine and refrained from collecting their own debts in the usual manner. It is hardly to be expected that other nations will willingly accept the extension of the Monroe doctrine to China, which has protected defaulting South American states against occupation by the armed forces of powers whose subjects have been openly robbed by unscrupulous military dictators. The time must arrive when the American government must either take the initiative in proposing some way out of the Chinese muddle, or step aside while other powers bring their own pressure to bear upon China for the collection of legitimate debts.

The present situation is intolerable. If China is permitted to dawdle along and solve her problems in her own way and in her own good time, without the offer of a helping hand, the chances are that the existing chaos and anarchy will in time equal, if not surpass, the debacle in Russia. As Minister Schurman concisely put it, "an anarchic and impotent China is a menace to the peace of the world," something that the other powers in self-defense could not pass by. Especially is this true in so far as her immediate neighbors, Japan, Great Britain and France are concerned. They would be the first sufferers from the spread of anarchy in Asia. From her safe distance America can afford to view these matters from a detached and altruistic standpoint. The conflagration is not likely to disturb the even tenor of American life and prosperity. The other powers, however, are in a dangerous position and sooner or later must act to protect their interests.

The time has therefore arrived when America must shoulder the responsibilities imposed upon her by the Hay doctrine and the treaties arising out of the Washington conference, and as the friend of China, take the initiative in placing into practice the doctrines she has advocated and upheld for the past two decades. It may mean the calling of another conference, the arriving at another international understanding that will give effect to the Washington treaties and preserve China for the Chinese, insure the peace of Asia, of the Pacific, and of the world. For just so sure as China is permitted and encouraged to drift into further chaos and bankruptcy, a situation will arise calling for energetic action by some individual power whose own vital policies will be jeopardized by such conditions, and then international co-operation in a military sense will be precipitated on a large scale in order to avoid the re-establishment of the spheres of interest.

Unless the American people are willing to participate in a military occupation of China they must be prepared to throw overboard their traditional policy of the "open door" and accept the temporary impairment of China's administrative independence by other powers until such time as their just debts are collected. At all events, unless the Chinese unaided overthrow the rule of the *tuchuns* and establish a government satisfactory to themselves and the other nations, the American people must face the possibility of eventual participation in an armed occupation of the principal interior cities of China as the only safe guaranty that the country can again be placed on its feet as a going concern. It is to be hoped, however, that before such a drastic solution to present anarchic conditions is discussed seriously by the powers, that the Chinese, recognizing their own impotence, will of their own accord, invite such friendly foreign co-operation in order to enable a stable government to impose its will upon the gang of military freebooters who now hold the people at their mercy, and so permit the collection of revenues without which no central government can function and discharge its international obligations. That the situation is gradually drifting towards the imposition of a receivership over China's revenues is a fact patent to all impartial observers. Unless the Peking government is able to meet its mid-autumn obligations, an official announcement of bankruptcy cannot be long delayed.

What is the solution ? The answer to this question is unanimous. An "international debt commission," "international financial control," "a receivership" "foreign audit and supervision over the collection of revenues"; they all mean the same thing. How is it to be brought about? Ask the average observer in Peking and he will wring his hands and admit the difficulty of applying the remedy. The impression gained after interviewing the wise ones in Peking, is that no foreigner dares to incur the enmity of the Chinese by openly advocating a solution they all privately admit is inevitable.

Foreign sentiment in Peking is swayed by its environment; the news that emanates from the press bureaus is ninety per cent. pure propaganda. To a man, foreigners in Peking look up to Wu Pei-fu as the savior of China, closing their eyes to the fact that his power is derived from pocketing state revenues to an amount estimated at anywhere between $25,000,000 to $50,-000,000. In addition, he is charged with extorting over $10,000,-000 in the past year, through forced levies on the people of the provinces under his control. The "Hope of China" has materially contributed to plunging the government into bankruptcy, yet the Peking claque defends these peculations, while villifying Chang Tso-lin, Sun Yat-sen and other *tuchuns* for resorting to the same practices. On the other hand, foreigners in Manchuria swear by Chang Tso-lin and while Sun Yat-sen was in power at Canton the verdict was unanimous that his rule was most liberal and beneficient. Wu Pei-fu has had the advantage of being closest to the news centre and of having several newspaper correspondents on his staff of advisers.

Nothing matters to this group but Wu Pei-fu. The interests of China and of their own countries, are subordinated to its personal hopes and aspirations. It selected Wu to take the place of Li Shun whose untimely death upset its previous plans, and have since boomed him, advertised him, sung his praises and literally rammed him down the throat of China, and through control of foreign news agencies, compelled the world to accept him at their own estimation. Immediately after the defeat of Chang Tso-lin and installation of the new puppet president, this *bloc* launched the drive for the negotiation of a large foreign loan to enable their favorite to consolidate his power and at the same time provide the funds which would ensure the prompt payment of overdue salaries without which the *bloc* could not exist. The fact that Chang's Manchurian armies were still intact preparing for another test of strength and that Sun Yat-sen retained his political prestige and power in the South, counted for nothing with the *impresarios* directing the activities of the Kin-Han war-lord. They refused to see that any loan at this time to Wu Pei-fu would only be dissipated in financing further military operations under the pretext of forcing unification at the point of the bayonet, an invitation to prolong the civil wars which have brought China to her present deplorable plight. Lending money to Peking before unification of all political parties is like pouring water through a sieve. The more that is loaned the longer internal strife will continue. A loan to China prior to the establishment of a stable government representative of the whole country is putting a premium upon civil warfare, a crime not only against the Chinese people, but a betrayal of foreign investors influenced to believe that all is well in Cathay.

Li Yuan-hung had hardly taken his seat in the puppet presidential chair, when the consortium representatives in Peking were approached for an advance of $2,500,000 per month to defray administrative expenses, to be secured on the increased customs revenues. Although the ministers of the consortium powers concurred in that some financial assistance to China should be considered, the Japanese minister took the firm and sensible stand that any advances pending complete unification would constitute an unfriendly act, a direct intervention in the internal affairs of the country. At this time, we are informed, the Chinese were willing to approve of international audit and control over their foreign loans, utilizing the estimated increased income from the new customs tariff now under revision as security for a bond issue to cover defaulted obligations and current administrative expenses.

The attitude of Japan was endorsed by the other powers and the Chinese overtures turned down pending the establishment of a government representative of all sections of the country. In the meantime, the distracted temporary cabinet, between being mobbed by unpaid employees and harassed by foreign creditors, has moved heaven and earth to raise the wherewithal to maintain itself in power. Finding all sources of foreign financial assistance closed, it turned once more to native bankers for relief. Here they also met with cold rebuffs because of the fact that the salt revenues set aside as the security for various loans advanced by the Chinese Banking group have been diverted to other purposes and, as a consequence, the native bankers who issued the railway car loan last year are unable to meet their obligations to the foreign manufactures. Typical of the methods employed to raise even a paltry hand-out was the attempt to obtain a loan secured on the Shanghai mint, an establishment as yet in the course of construction, with the machinery ordered, and delivered but still, unpaid for. Against this scheme, the American minister lodged a protest. Failing to receive financial assistance from within the country and with the mid-autumn settling day only a few weeks distant, the cabinet ministers are scurrying to escape responsibility. Unless Wu, Sun, Tsao and Chang come together without delay and sink their political differences for the welfare of the nation, China faces the prospect of being declared a bankrupt.

The initial steps to this end may be said to have been taken at a recent meeting of the consortium representatives in Peking when they telegraphed their head offices that China was without a government and completely bankrupt, unable to meet even her current administrative expenses. This verdict, we learn, was approved by the ministers of the four consortium powers.

As it is impossible to dissociate the consortium banking groups from the governments whose support enables them to exist, this decision constitutes an official recognition of China's bankruptcy, a prelude to further diplomatic action. Unless unification is brought about quickly it is difficult to see how the next crisis can be weathered.

The appointment of a debt commission to audit and supervise China's finances while the country is disunited is no solution to the problem. Such intervention would be stubbornly opposed by all the independent *tuchuns* and obstacles placed in the way of the collection of revenues. Under present conditions, the only revenues that could possibly be attached and forcibly collected by foreign creditors are the maritime customs. The collection of the salt, wine, tobacco and railway revenues against the will of the people or the opposition of any of the powerful *tuchuns* could only be assured by an army of occupation holding down the principal trade centres of China. Obviously, such drastic remedies could only be applied as the result of a close understanding on the part of all the powers and in which each would contribute its proportionate quota of troops. It is difficult to believe that any foreign government at this stage of world stress would countenance such measures unless complete anarchy in the country menaced the peace of Asia and the vital interests of neighboring powers.

The one hope of establishing a workable foreign debt commission lies in the chance that the Chinese themselves, recognizing their own impotence to pull themselves out of the hole, will invite such friendly co-operation. Here, however, we face the certainty that there is no official in Peking who dares assume this responsibility. At the present moment all the old skilfull loan negotiators have ducked out of sight, leaving the crisis to be faced by the foreign educated group of young statesmen headed by Drs. Koo, Wang and Yen. It is extremely doubtful whether any one of these able men would be willing to jeopardize their future careers by accepting international control over China's finances, even under an ultimatum of the powers. Yet the time must conceivably arrive when these conditions will be imposed by the powers in order to save China from herself.

In discussing this eventuality with various persons in Peking, their opinion was unanimous that the only Chinese political leader possessing the requisite moral courage and integrity to accept such conditions for the salvation of his country, was Dr. Sun Yat-sen. Coming from men breathing a propaganda polluted atmosphere and schooled by the claque to express admiration for Wu Pei-fu, such statements indicate a new trend of thought, a breaking away from influences which for several years past have molded foreign public opinion in the northern capital. These same people were open in their statement that the time had arrived when Dr. Sun should be given an opportunity, believing that his example of honesty would go far towards reducing corruption in the conduct of administrative affairs. It was recognized that his ascendency to power could only come through complete unification, which in itself, would render superfluous the maintenance of large armed forces by the various provinces, and do away with the incentive to further misappropriation of state funds. As president or premier of China, Dr. Sun Yat-sen might go the way of others before him, but he is entitled to an opportunity. Although unification under a military satrap might unloosen the purse strings of foreign bankers, the impression is gathered that such financial assistance would be greatly facilitated by the election of an non-military leader to the presidency.

China has survived many financial crises. At the last moment money has been forthcoming from the most unexpected sources. She may survive the next settling day and drag along until the Chinese New Year. The chances, however, are against it. Naturally, the Peking officials are circulating the over-worked argument that China's inability to meet her foreign obligations is only a

transient phase, and the inexhaustible resources of the country are ample guarantees of her stability. This optimism and faith, however, cannot offset the plain truth that these resources are as yet undeveloped and unavailable as security for outstanding obligations. There is also a natural disposition on the part of all creditor nations to live up to the spirit of the Washington treaties and give China every chance to pull herself together, but, if during this long drawn out period of rehabilitation, the leading foreign commercial firms in China are forced to the wall by reason of the inability of the Chinese government to pay its current obligations, China will receive a set back from which she will not recover for many years.

The loss of American confidence and credit incidental to a prolongation of the present situation and the hardships imposed upon American traders will deprive China of American participation in future reconstruction loans and throw the burden of financing her development upon powers who might not hesitate under given conditions to revive the sphere of influence doctrine as the only safe guarantee that their investments would be properly safeguarded.

If, therefore, China is to be saved from herself, it would seem that the time is most opportune for the American government to take the lead in proposing some remedy whereby her finances may be placed upon a solid foundation. In justice to American policies, and to our merchants and bankers who have responded to the official invitation to develop China ; in fairness to the other powers who have followed our lead and subscribed to our doctrines, and in friendly consideration for the Chinese people, President Harding and Secretary Hughes should instruct Minister Schurman to find some practical manner to apply the policies laid down by the Washington conference. Further drifting is dangerous. Unless some way can be found to save the situation and bring order out of chaos, the work of the Washington conference will go for naught. American prestige in the Far East will never survive another breakdown of our policies.

Stability and prosperity can come to China only as the result of a cessation from domestic strife. It will not come through the ascendency of any one " strong man " in the person of some super-*tuchun* with great armies to enforce his mandates, but through political unification, a coming together of all factions and the selection of some non-militarist to head the new government. No man, no matter how strong, how honest, patriotic and capable he may be, can succeed unless he represents a unified nation. That is basic. And real unification will never come to China so long as any one factional chief is financed directly or indirectly from the outside. That also is basic.

It is no longer a question of whether Wu, Chang, Sun, Tsao, Li or Chen is the best man. A stop must be put to the financing of any one faction, and the way to stop is to stop right now. If foreigners are to finance a Wu Pei-fu government over a period while he is strengthening his position to crush Chang Tso-lin, or Chang is to be assisted to re-open the issue with Wu, China will drift into a position where foreign intervention will become inevitable. It is better for the foreign powers headed by the United States, to intervene in China at the present time in a friendly and helpful manner by insisting upon unification at once rather than to drag out the agony by financing the Wu Pei-fu cabinet for another ten months and then perhaps be compelled to intervene in unfriendly manner. Prompt unification and the formation of a coalition cabinet, means prompt assistance from the financial instrument of the powers, the consortium. Any attempt to defy the powers at this time by seeking to raise outside loans, will not only defeat its purpose but create greater difficulties for China.

If we wait another ten months or a year for the parliament to draft a constitution and Wu Pei-fu to settle his score with Chang Tso-lin, the control of China will have passed out of the hands of the *tuchuns* into those of the bandit chiefs. As the mandarins gave way to the militarists, the latter will give way to the bandit leaders. Over 40,000 so-called bandits are ravaging the province of Shensi, while the provinces of Honan, Anhuei and Shantung are overrun with these gentry, to say nothing of the chronic situation in Manchuria, where the Hunghutzes defy Chang Tso-lin to suppress them. In fact, nearly every province is overrun with these bands preying upon the helpless people. Towns are burnt and sacked, women torn from their homes, and men pressed into the service of the bands. Foreigners are siezed and held for ransom, and even the son of the redoubtable Christian General Feng was kidnapped from under his father's protecting wing on a recent trip to Kueiteh. The situation in Manchuria goes from bad to worse. Within the past few months several attempts have been made to interfere with the South Manchuria Railway, and recently the rail fastenings were loosened and the express wrecked. There is a limit to such practices. The forces of Wu Pei-fu, Chang Tso-lin and other military chieftains are helpless before the bandit rule. Any serious attempt to eradicate these bands only result in their augmentation by the desertion of the uniformed troops sent to suppress them. This is ANARCHY. This is CHINA. The foreign powers can prolong the situation and make matters worse by financing any one faction, they can advance sums to Peking in order that parliament, the " salary demanders union " and hordes of officials can be sure of their pay for ten months more, but at the present rate of progress, when that time expires, the white wolves of China will rule the country. The foreigner will again be asked to furnish the funds to restore order. A vicious circle. Stop it now.

GEO. BRONSON REA.

* * *

"China's Financial Independence"

ACCORDING to American dispatches, Dr. Paul S. Reinsch has accepted the post of financial adviser to the Chinese government. A Reuter's report dated Peking, September 9, gives the gist of his speech before an informal gathering of high officials at Dr. Koo's residence, the subject being "China's Financial Independence." Dr. Reinsch said :

" If Chinese financiers and bankers take the initiative in elaborating a practical policy they can undoubtedly count on international support. The present situation calls for self-help, at least in initiating a plan, as the other nations are too busy with their own affairs. A practicable proposal regarding Chinese finance would, however, receive support. Nevertheless, we must realize how near China is to a financial breakdown and what it would mean. The underlying economic condition of China is so favorable that the financial problems could be easily handled were there initiative and co-operation.

" Dr. Reinsch proposed "a Constitution interim loan" of G.$2,000,000 monthly for 10 months to give the government a chance to exist without worry during the constitution-making period. Meanwhile, a financial commission would elaborate a system of revenue reform with the co-operation of national and foreign banking representatives. Should the proposed consortium make the above loan its representatives would co-operate with the financial commission. This was the time when such assistance should be given. Later, it would be unnecessary, or too late to avert financial disaster. Such co-operation between the Chinese government, Chinese bankers and foreign financial experts would in itself restore the credit of the government. Should the consortium decline to make such a loan or propose terms which would induce a long discussion by parliament and consequent delay in the completion of the constitution it would then become necessary to invite banks outside the consortium to take up the matter.

" The taxable resources of China, when they could once be reached by new legislation after the constitution has been established, were far more ample, he said, than the resources available in any other country except the United States. What China needed was not the much-discussed "strong man" but only a good financier and team work between the Chinese government and the bankers. " China does not come before the world as pleading for assistance but as offering a plan for the development of her financial resources."

The remarkable part of the plan outlined above is the threat to invite outside banks to finance China in the event the consortium declines to advance the necessary monthly payments to tide over the government until a constitution is drafted. It should not be overlooked that the author of the above plan is the author of the consortium, the energetic statesman who formulated the Far Eastern policy of the Wilson administration, and so directed American activities in this country, that the only escape from a return to the closed sphere doctrine lay in international co-operation as the only way that American capital could hope to participate in its future development. It was Dr. Paul S. Reinsch who laid down

the rules, got the American bankers interested, induced President Wilson to reverse his policy of 1913, apologize to Wall Street and carry through the program which definitely destroyed China's financial independence.

As representative of the American government, Minister Reinsch forced through the present consortium. Now that it is adhering strictly to the rules of the game as laid down by himself. High Financial Adviser Reinsch in his rôle of a Chinese official, threatens that unless the rules are broken, outside bankers will be invited to finance China. As a Chinese official Dr. Reinsch would destroy what he committed the American government and nation to build up.

It was always a mystery why the Lee-Higginson loan of 1916 fell through. Here was an instance where an American banking group had a contract to furnish the Chinese government the sum of $25,000,000. In the final arrangements, the firm of Lee-Higginson and Company were to have been made the fiscal agents of the Chinese government, and the first installment of $5,000,000 was to have been paid over; $1,000,000 at once, and the balance within fourteen days. The $1,000,000 were paid, but the balance was never forthcoming.

In the chapter on the "Downfall of Yuan Shih-kai" in Dr. Reinsch's book ("An American Diplomat in China") he says:

"At this juncture I had to decide whether to allow the Lee-Higginson loan to be completed without a caution and warning, or to assume responsibility of virtually stopping that transaction. As soon as it became clear that open opposition to Yuan Shih-kai's government was no longer confined to one province and its immediate sphere of influence, it seemed no longer proper for any American institution to furnish money to the Chinese government. Many appeals had been made by the opposition based on the demand that, since the country was divided, no loans should be made to the government. In ordinary circumstances the protests of factions would not have weight, but when several provinces expressed their disapproval of a basic governmental policy the case was different."

The Lee-Higginson loan stopped with the advance of $1,000,000, and from the confessions of Dr. Reinsch, it would appear that his official intervention was the direct cause of its failure. We can see no difference between the situation existing in the spring of 1917 and the situation to-day. The Peking government is not representative of the country as a whole. It is the puppet of one military leader, opposed by the three eastern and several provinces in the south and southwest. A loan to Peking at this time that would enable the Wu Pei-fu cabinet to consolidate its power against the protest of other sections of China, would come under the same category as the one which Dr. Reinsch, as American minister, so effectively squashed in 1917.

The originator of the consortium fashioned an instrument which deprived China of her financial independence and then clamped and double riveted the yoke so it would stay put. It will be difficult to release China from financial dependence upon the consortium, and, if as Dr. Reinsch now advocates, outside banks are to be invited to finance the Peking government, and they succeed, why all agreements will be declared off and other independent banks will take advantage of the scramble that will be sure to follow. We will return at once to the same situation that preceded the organization of the consortium, with an open field for all.

It took over three years of the most strenuous diplomacy to perfect the present consortium and the irony of it all is that although its creators fashioned an instrument calculated to destroy Japan's financial influence in China, a turn of the wheel has given to her the right to oppose any loan to Peking before complete unification is brought about. British and American sentiment may favor a consortium loan at the present time to the Wu Pei-fu cabinet, but it is hardly probable that her partners will insist upon Japan joining them in a financial adventure which the consortium was specially designed to guard against. Japan holds the whip hand for the moment. And as there seems to be no likelihood of a break in the consortium understanding, its creator stands aghast at his own handiwork. Dr. Reinsch is placed in a most unenviable position. If his plan goes through it would mean the destruction of the consortium and a return to a free for all scramble in which the independent Japanese banks will not be far behind those who may break the deadlock. Past experience warns us that American capital will be slow to invest in China, and the urgent needs of the Peking government will again cause it to turn to Japan for financial accommodation. As long, however, as the various governments act in good faith and support their respective groups, it is difficult to see how Dr. Reinsch can break the shackles he forged and riveted upon China's financial freedom.

* * *

The Goat

On board one of the big Pacific liners two years ago, a Japanese friend came to me and said "I did'nt know that the Gaimusho (Japanese foreign office) had a goat." What do you mean by goat, I asked? Well, I have just left the smoking room where there is a spirited discussion going on about Japan and America, and someone said that Mr. So and So (a well-known diplomat) had got the Gaimusho's goat and everybody seemed to think it a huge joke. When I also laughed, he gravely insisted that it could not be true as he was certain the Gaimusho did not keep a goat. It took some time to explain the exact meaning of the word "goat" in the vernacular American, and the nice distinction of being made one and of the sport in getting the other fellow's animal. "I see," he said, "Japan has been made the goat so often in Chinese affairs that there must be quite a herd browsing around the Gaimusho's lawn." I met my friend a few weeks ago and in inviting my attention to the foreign office protest against an article in *The Times*, he remarked quite casually, "there goes another of the Gaimusho's goats."

I inclined, however, to view the matter from the other angle and see in it another attempt to make Japan the goat in China. It was not so very long ago that Mr. F. W. Stevens, the representative of the American group in the consortium, in a speech before a student's gathering in Peking, invited attention to the fact that the consortium plan was proposed by the American department of state in the summer of 1918, following or in the midst of the so-called Nishihara loans, a fact he mentioned as significant, a plan unquestionably dictated by friendliness to China." Now, the real truth behind the American invitation to the other powers to join in a new international financial combination arose from the fact that the activities of the Wilson administration had effectively closed the door to further independent American financial participation in the development of China and international co-operation became necessary in order to abolish the spheres of interest. The Nishihara loans had absolutely nothing to do with the motives underlying the formation of the new consortium, but this pretext was seized upon by its official sponsors in order to divert attention from their own blunders. Japan was made the goat in order to cover up the mistakes of the Wilson administration in China. It was either the consortium or an *exposé* of its own inefficiency, so the administration reversed its policy of 1913, and requested Wall Street to again enter the Chinese field, and behind the smoke screen of a violent anti-Japanese press campaign escaped an inquiry into its activities.

Japan became the goat of the Pacific. The pressure brought to bear upon her by the United States and Great Britain influenced her to throw overboard old policies and work in harmony with her new partners. As a result of a most bitter anti-Japanese campaign the so-called unsecured Nishihara loans were repudiated. Not a cent of interest has been paid to date, and this adventure into the Chinese financial field stands as a dead loss to the three banks which accepted the invitation of their government to advance the funds. Intervention in the internal affairs of China through the financing of the northern party, recognized by all the powers as the *defacto* government, taught Japan a costly lesson. Since then, the consortium leaders have time and again gone on record that complete unification is the first requisite to a Chinese government loan. The highest officials of the Japanese government have reiterated the

same statement for the benefit of all parties in China. In the words of Baron Ijuin of the Japanese foreign office, the advice of his government to China is to UNITE, UNITE AGAIN and keep on UNITING. Only then, after a stable government representative of the whole country has been established, could Japan demonstrate her friendship by remitting her share of the Boxer indemnity and joining with the other powers in furnishing reorganization loans to China. The policy of the consortium has been the policy of Japan.

In the meanwhile another civil war broke out in China, a conflict between Wu Pei-fu supported by British and American sentiment and Chang Tso-lin, overlord of Manchuria, the alleged tool of Japan. Wu won in the initial trial of strength and a campaign was at once started to railroad through a reorganization loan that would consolidate his power and repeat the deal of 1913 which enabled Yuan Shih-kai to solidify his despotic rule and crush the parliamentary movement headed by Sun Yat-sen. The consortium representatives at Peking were requested to advance monthly payments amounting to $2,500,000 to be secured on the estimated increase of the customs duties. Although the foreign ministers agreed that the time might be propitious for assisting the Chinese government, no definite arrangement was arrived at, and while the matter was being considered the situation in Peking rapidly changed. It soon became evident that Wu Pei-fu would be unable to consolidate his position and force unification. The Japanese minister, remembering the costly experience of his own country in attempting to bolster up any one faction in China, very wisely took the stand that any loan to the Wu Pei-fu government before complete unification would be considered by the Chinese as an unfriendly act, an unwarranted intervention in the internal affairs of their country.

We now learn from a dispatch to *The Times*, dated Peking, August 4, that the diplomatic corps had agreed to extend financial aid to China but that this was blocked by the opposition of Japan. *The Times* correspondent then indulges in day dreams and confesses that he is not in a position to know whether Japan's opposition was prompted by a desire to exercise pressure over the Shantung negotiations or whether it was due to her disinclination to see the firm establishment of a stable Peking government until the restoration to his former influence of General Chang Tso-lin. Whatever may have been her true motive, adds *The Times* correspondent, it amounts almost to a crime to deny China such assistance as to save her from her present financial straits and to help her to restore order.

We have here another picture of the playful pastime of making Japan the goat, in which the confessed speculations of a correspondent is published by one of the greatest newspapers of the world as legitimate news. It was taken for granted by the *bloc* who had been grooming Wu Pei-fu for the job of dictator, that his temporary victory signified immediate unification of China, that it was all over but the shouting. It never seemed to occur that unification might also mean recognition of the Kuomintang and its leader, Sun Yat-sen, or that even Chang Tso-lin might have a kick left in him. As matters have turned out, Sun Yat-sen is very much alive and attending to politics, while Chang from all reliable reports is reorganizing his forces to have another crack at Wu. Under the circumstances, a loan to Wu Pei-fu that would enable Peking to unite the country at the point of the bayonet, simply meant that the foreign advances would have gone the way of the Nishihara contributions to the Anfu faction. It is safe to say that very little would have been expended on actual fighting, and the time would again arrive when the Chinese would approach the foreigner for further advances in order to restore order.

If, as *The Times* correspondent asserts, " the diplomatic corps in Peking agreed to extend financial aid to China," it was surely about time that some diplomat rose to the occasion and vetoed a proposition that would only have prolonged civil war and political unrest. The attempt on the part of *The Times* correspondent to make Japan the goat for her common sense attitude, influenced the Japanese foreign office to issue the following statement on August 14 :—

" Dispatches published in *The London Times* and some other journals criticizing Japan's recent attitude towards the question of financial aid to the Chinese government have come to our notice. We wish to repeat the fact that the attitude of the Japanese government towards China is, as has on occasion been declared since the days of the last cabinet, one of non-interference in China's internal affairs, and we neither favor nor disfavor any particular party or faction in that country. To favor or support a particular influence in China would be tantamount to furthering her domestic strife. This would be most unfortunate to China, and would also work to Japan's disadvantage.

" We sincerely respect China's sovereignty, and wish for her peaceful advance and development. It is our hope that, at the earliest possible date, China will promote peace and well-being within her borders, open up her natural resources, and attain a healthy political development. If these hopes are realized and when the time is ripe for the establishment of a unified government representing the will of the people of China, the Japanese government will gladly give as much support as circumstances will permit to a government thus backed by the Chinese people as a whole. The government and people of Japan hope and believe that this happy occasion will be brought about before long by the efforts of the Chinese people themselves.

" But at the present moment, when that occasion has not yet arrived, Japan considers it most appropriate to refrain from giving financial aid to the Chinese government. The reason is: should aid be given to the central government of China while her political situation is unsettled and while that government is constantly swayed by the influence of some clique or other, it would not only be contrary to the principle of non-interference in China's internal affairs, a principle which has frequently been avowed by Japan and which has equally been observed by the either powers, but would also destroy the tendency towards better conditions which has just set in through the efforts of the Chinese people, and would thus interfere with the realization of a unified government, the result being greater chaos in China. In the opinion of the Japanese government, therefore, it is yet premature, in the light of the present political situation in China, to give financial aid to the Chinese government at this moment. This attitude of the Japanese government is in complete harmony with the purpose of the nine-power treaty and resolutions relating to China, which were adopted at the Washington conference ; the opposite course of action would be an infringement upon the spirit of those international engagements. Such being the case, the Japanese government have no intention to alter their policy frequently declared in the past."

It cost Japan over $200,000,000 to express the above sentiments. If we remember rightly, *The Times* correspondent at Peking was one of those who denounced the Nishihara loans and encouraged their repudiation. It was a crime on the part of Japan to bolster up the Anfu military faction, but now that the shoe is on the other foot, and the favorite of *The Times* correspondent is on top, it is crime not to support him. Japan may have been responsible for the advantage her loans conferred upon the northern military group, but nevertheless it was recognized by all nations as the *defacto* government. In the eyes of the Wu Pei-fu claque Japan may again be guilty of a crime in opposing financial assistance to their favorite, but we feel certain that the liberal element in China, the party of Sun-Yat-sen and the adherants of Chang Tso-lin, wiil be duly grateful for this evidence of her disinterested friendship. By this one act, Japan wipes out the past. A few more " cirmes " of this nature will undo the propaganda of years and endear her to the Chinese masses. Japan has been made the goat long enough. It is time for fair play.

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The Creaking of the Shantung Door

THE Japanese have no doors in their own houses. When they travel abroad and discover these facilities for ingress and egress in other people's homes, especially in China, where they are large and ponderous, they take a childish delight in swinging them back and forth, turning the knobs, fiddling with the keys, pushing the bolts in and out, inspecting the hinges and banging the old things just to see how they work. A door is a wonderful thing to a Japanese ; it has so many uses. Now, if there is one thing that jars the nerves of the inhabitant of North America is the creaking, squeaking and slamming of doors. They hate to hear a door slammed. It is not done in polite society. A door can be closed gently and the key turned so as not to attract undue attention or violate the conventions. The booming of the great guns in Europe left Americans indifferent for three years, the crash of tumbling dynasties phased them not, the roar of the elevated railway and the rumbling of the subway and the strident cries of the street are as balm to the jaded senses of the New Yorker, but let some one whis-

per, " Hark ! did you hear that ?" " No, what is it ?" " Why, it sounded like the creaking of a door over in China." Nothing annoys like the noisy noise of a closing door in China. No matter whether the Chinese are busy erecting obstructions to the free and unrestricted passage of Americans through their many angled gateways, or that other powers have quietly fenced off private preserves, yet when the Japanese makes a noise like the closing of a door, Americans at once sit up and take notice. It is not always necessary for Americans to hear the noise themselves. The confidential statement of any Chinese that the Japanese are fiddling with the hinges is sufficient to bring forth an immediate protest.

The Japanese are queer people about doors. For the past eight years they have guarded the portals to Shantung and have been very generous about conceding other nations a free passage to the trade beyond. Amongst other things they accumulated when Tsingtao surrendered in 1914, was the control over a railway, equipped throughout with German materials. Even the nails on this road bore the mark " made in Germany." One of the first things the Japanese did was to change all this. They decided that the door that had been closed to American manufacturers for so many years by the Germans, and without any loud protest on their part, should be opened to them. In fact, the Japanese said, we will make an American railway out of this little Deutscheeisenbahn. And they did just that little thing. The locomotives and cars, the rails, machine tools and other accessories that have poured into Tsingtao the past seven years, all bore the trade-mark of some American firm. From behind the familiar American locomotive, trailed the passenger and freight cars, which if not all made in America, were built to American specifications.

Now the Japanese also build locomotives and cars. Of 3,122 locomotives in use on the Imperial Government Railways in March, 1920, over 31 per cent. were constructed by Japanese firms. The actual capacity of the various Japanese locomotive shops is about 350 locos per year. The number supplied to the Imperial Government Railways in 1920 was 170. The time had to arrive when, if these shops were to be kept going, foreign markets would have to be developed to absorb the surplus. The same with cars. As the Japanese government could not purchase its railway material requirements abroad during the war, the home manufacturers were encouraged to extend their plants in order to supply the domestic demand. In the meantime, American manufacturers were called upon to furnish the broad gauge rolling stock for the Korean, Manchuria and Shantung railways. They had a practical monopoly of this trade, and in the case of the Shantung line supplied forty-one locomotives. Now, if the Japanese had been anxious to build up a market in China for railway materials and rolling stock, it would have been an easy matter for the government to have ordered its locos and cars direct from Japanese manufacturers, at least, sufficient to have given them an entering wedge.

However, the foolish Japanese did nothing of the kind. They continued to place their orders for the Shantung Railway in the United States. Came the Washington conference and the agreement which compromised Japan to evacuate Shantung. About this time, the railway needed a few more locos and cars to take care of its growing traffic. The war boom was over and the limitation of armaments deprived the great Japanese machinery builders of their best paying work. They turned to their government for relief, and suggested that an opening be found for their products on the Japanese controlled railways in China. It is true they had never before built standard gauge rolling stock, but they could try. The Japanese government suggested to its civil administrator at Tsingtao that if an opening could be made for Japanese manufacturers in supplying the requirements of the Shantung railway, it would help the home industries over a very trying period of depression. Shortly after, an order for six locos was placed with two Japanese manufacturers, and the noise that ensued could be heard over the rumble of a crumbling China. A door had been slammed. American and British firms had been frozen out and immediate protests were made against the violation of the Hay doctrine and the Washington treaties.

In confidence, the information had been imparted to the American legation that the Chinese and Japanese delegates on the Shantung commission had entered into a secret agreement to purchase all materials for the Shantung Railway exclusively from Japanese manufacturers. Of course, such confidential disclosures of a secret agreement could only come from some of the Chinese connected with the negotiations. The American minister immediately protested against the violation of the "open door." Not that the placing of the order for six locomotives was in itself of importance, but the principle of equal opportunity had to be defended.

The Japanese simply state that as far as any secret agreement is concerned such a thing is mere piffle. They say the Chinese have followed their usual custom of setting one set of officials to watch the other, and, as in the case of the Washington conference where certain people's delegates were present to watch the official appointees, they have followed the same procedure in the Shantung negotiations. Here, they assert, are a number of so-called " Shantung Observers " attached to the Chinese delegation, representing the people of Shantung province. In order to give these unofficial delegates an official standing, the Chinese government is paying them the nominal sum of eight dollars per month. When the Chinese delegation files into the committee room, with its group of " Shantung Observers" included in the delegation, its chairman can truthfully inform the Japanese that everybody there is a " Chinese official." Dr. C. T. Wang and the other appointees of the Peking government are being watched like hawks by the Shantung representatives and as the Japanese point out, " if anything secret can be put over with this group of sleuths on the job, they would like to know about it."

On the other hand, they state that the real secret attached to the placing of the order for locomotives with Japanese manufacturers is that the Chinese had no money to pay for this new equipment and asked the Japanese to purchase the locos and accept their paper promise to pay in the future, in other words, to add it to the Japanese bill. As the railway is not yet turned over to the Chinese government, and is still under control of the Tsingtao civil administration, a bureau of the Japanese ministry of war, the Japanese government had a perfect right to place the order where it saw proper, without the invitation of tenders. They furthermore state, that in addition to the six locomotives whose purchase was agreed to by the Chinese, an order for forty cars has been placed in the same manner. These cars will not be delivered until next year, when the line will have been turned over to the Chinese, but again, the latter said they had no cash to pay for this material, and as the railway required the cars, they requested the Japanese to supply them and accept their I.O.U. That is all there is to the story, say the Japanese. They furthermore invite attention to the fact that if they are to be paid for the Shantung Railway in five year bonds or longer, they are entitled to impose the same terms and conditions as obtain in all other Chinese railway loan agreements, viz, that preference shall be given to Japanese materials during the life of the loan.

If the confidential information furnished the American authorities at Peking is correct, then Minister Schurman did the proper thing in promptly protesting against the closing of the door to American manufacturers to equal opportunity in the supply of materials to the Shantung Railway. If, however, he was misinformed as the Japanese insist that he was, the incident simply revealed how nervous Americans may become when someone tells them a door is creaking somewhere in China.

The question is bound to arise sooner or later, whether China as a sovereign state, is not at liberty to place her orders for materials where she wills, with or without tenders that admit manufacturers of all nations to equal opportunity. As long as the Shantung railway remains under exclusive Japanese control, it would seem that her officials have the right to favor their own manufacturers without other powers protesting against a violation of the "open door." When the line is turned over to China, it would also seem

that the same fundamental rule would hold good. The original conception of the Hay doctrine was to save China from the spheres of special interest, in which American trade might be barred out by discriminatory laws and duties. The modern conception of the open door would seem to prohibit the Chinese government from exercising its undoubted right to purchase materials without submitting the tenders to international competition. In the case of the Shanghai mint, where this sovereign right was exercised and the machinery ordered from America without the British being permitted on opportunity to compete, there was no invocation on their part of the violation of the "open door" principle. In that instance, it was gross partiality, and unfair methods that were complained of.

Secret agreements are one thing and should be discouraged, but the right of China or Japan to exercise their undoubted prerogative in purchasing materials at their own discretion is another thing.

* * *

An Engineer Educator

THE time is rapidly approaching when Americans must revise their ideas about the education of Chinese and determine whether it is best to contribute large sums to continue their training in the United States where they absorb ideals difficult to live up to or put into practice on their return to China, or whether these young men are to be trained in their own country.

Charles K. Edmunds, Ph.D.

President, Canton Christian College, since 1907
Professor of Physics, 1903 to 1907

Observer in Charge, Magnetic Survey of China
Carnegie Institution of Washington, 1905-1917

When Washington made his will he put into it a provision that there should be set aside a certain sum of money in order that Americans might be educated in the early constructive days of the republic under the influence of American institutions rather than have their young training under the royalistic influences of Europe. In like manner, China needs, in the young formative college years, institutions on the soil of China where men are trained to understand the problems of China, to think as Chinese and to talk as Chinese, to dress as Chinese, and to develop as Chinese. We cannot Americanize China. China should be assisted to develop as China, for in that way she will contribute most to the civilization of the world.

Along these lines the Canton Christian college, with a half-dozen like it, is working in a strong, modern, scientific way for a solution of one of the world's greatest outstanding problems, doing for China what must be done if Asia is to fulfil her part as a cog in the great wheel of modern co-operative progress.

At this head of this successful institution is Dr. Charles K. Edmunds, an American engineer and educator, who left home twenty years ago to bring to China the best of our civilization. At a recent testimonial dinner given in honor at Delmonico's in New York, Dr. Edmunds brought forcibly before his audience the necessity of educating the Chinese in China, for China.

"The reorganization of China by Chinese aided by foreigners actuated by friendly and not predatory motives, the introduction of foreign capital and the internationalization of foreign interests in a cooperative spirit with China constitute the only hope as regards China's foreign relations and even as regards her internal development.

"That China greatly needs energetic, resourceful and unselfish leaders is apparent from a mere glance at the gamut of problems which she faces, political, economic, social, physical, industrial and educational, many of which demand immediate solution or at least immediate attack. These leaders should receive the bulk of their training in China, for they need to know their own land as well as western science, institutions and methods.

"Then, too, the common people must be educated to form the background of general enlightenment and the foundation of progress. China's educational problem is enormous. A population of 400,000,000 requires for an adequate public school system not less than 2,000,000 teachers for all grades. It will require at least another generation to develop such an educational army.

"In attempting to establish a republic before the people, by education, are prepared for it, and to establish public schools before the government is sufficiently stable to finance them, China has undertaken the greatest educational problem of all time.

"Mere education in the science of the west, mere contact with western civilization, commerce, railways, telegraphs, mines, etc., cannot be expected to regenerate China, for the Chinese seem never to have been profoundly moved by other than moral and spiritual forces.

"Progressive currents are at work in China, and when you consider the size of the country and her lack of communications, her lack of money, and the character of the treaties imposed upon her by foreign powers, it becomes clear that while China is not entirely free from faults, her present condition is not entirely the result of her own actions or defects, but has been partly imposed by unfair actions of other powers. I am convinced that if all concerned would observe the policy of "Hands off China except to help," the Chinese would in due time solve their own problems. But we must allow China the same measure of time which we ourselves required to solve the problems of state rights *versus* federal control. The so-called chaotic condition of China and her backwardness are over-emphasized. From intimate knowledge of conditions I venture to assert that economically and commercially China is probably to-day more normal than any other large nation, and in spite of the political differences which exist she is to-day more homogeneous even politically than any equal aggregate population anywhere else in the world.

"The spirit or genius of the Chinese people very closely resembles that of the typical American, and it behooves us to realize that not only will a closer co-operation between our two nations be of benefit to China, but in a very real way it involves also the future prosperity of our own land and the peace of the world."

Here speaks the true American leader in China. China must solve her own problems from within, and to do this her sons must be educated in China where they will understand their own problems and be able to take an active part in their national affairs as soon as they have completed their education.

Days of the Compradore are Numbered

By O. D. Rasmussen

SIGNS are not wanting in post-slump readjustments in this country of a gradual revision of ideas in the value of compradores to foreign trading organizations in China. Not only have many firms begun to doubt if the compradore is worth the large commission he takes, but in several cases they have begun to operate without him.

For over a hundred years the compradore has been the connecting link between foreign firms and Chinese dealers. His middleman services were at first a political expedient, rendered obligatory by restrictions placed upon foreign traders at Canton, where the East India Company and others were confined to a limited area, outside which their nationals were not permitted to go.

As with other customs in China, once established the compradore system became a permanent idea in the minds of both foreign traders and Chinese dealers. The system passed from a political to a commercial necessity. Foreign firms were content, with large marginal profits, to be relieved of the burdens incident to marketing and buying in a difficult language, while the Chinese dealers were glad, for similar reasons, to trade with men who dealt with them according to their ways and in their own tongue.

Thus, unfortunately, foreign firms placed themselves in the hands of a group of non-producing middlemen, upon whose cupidity and whimsicalities has depended practically the entire foreign trade of China since contact was properly established over a century ago. It was unfortunate because foreign firms neglected the essentials of commerce by allowing themselves to remain in ignorance of the language and without personal contact with the people with whom they came to do business.

The compradore system, it must be conceded, was not without its facilities. It would not have lasted so long had it been otherwise. But great as those facilities have been, they constituted in themselves, an obstacle to the proper development of trade relationships. Many foreign firms have been financed by compradore capital and tided over difficult periods by the same financial source. Moreover, the compradore was a guarantee of the commercial integrity of Chinese dealers and, with his organization of market shroffs and other intelligence, able to keep more or less in reliable touch with markets inaccessable to foreigners, ignorant of the language.

Had the compradores always acted with conscientious regard for the welfare of foreign business and the commercial development of their country they might have fully justified themselves and consolidated their position. But they have not. They have fallen down in many big and little things that prove their inefficiency and lack of dependability, especially when confronted with crises such as that through which business has recently passed.

To begin with they never educated themselves to the degree necessary to keep abreast of changes in their own country. They were, in numerous cases, ignorant of their own language and customs, witness the many stupid Chinese translations of foreign names, given by compradores to, and accepted in good faith by, foreign firms. They have permitted foreign firms to market goods under trade-marks and illustrations that have been offensive to their own people and which have resulted in failures, in connection with certain goods, which should have, with different marks, found ready markets.

When the piece-goods and woollen goods exchange debacle smothered the entire economic structure in 1920, and Chinese dealers repudiated their obligations and in many cases fled from the jurisdiction of treaty ports, the reputed guarantees of compradores fell sadly to the ground. Their mythical guarantee was no stronger than the dealer himself. In fact, in many cases, the compradores took up a position on the side of the dealers against the foreign firms. They backed the dealers, in spite of the latters' own responsibility for not booking exchange contracts to meet their engagements.

In connection with the same trouble, the compradores introduced and permitted Chinese dealers, upon no security whatsoever, to make contracts with foreign firms for piece and woollen goods, to an amount far beyond their ability to finance. Almost any office boy in a long gown, attracted by the profits of a 9/- tael, could enter orders for piece-goods. Consequently, with the cupidity and business acumen of an office boy these whip-poor-will dealers, gambling on the chance of getting a 12/- tael, found themselves overnight, facing gigantic losses on a tael that slumped to 6/-.

It is true that some inexperienced foreign firms, mostly American, dealt independently of compradores, but the large majority were dependent upon their middlemen for the integrity and financial security of dealers.

However, it is sufficient to prove the failure of the compradore system, when it is considered that with or without compradores, foreign firms were forced to the wall in the crisis.

If there are apologists who find extenuating circumstances in an extraordinary state of affairs such as the 1920 exchange slump represents, they would be hard pressed to find further apology for the combinations in restraint of trade practised by compradores during the period immediately preceding and following that crisis.

In North China, as an example, sheep's wool that in previous years was bought from dealers for 15 taels a picul, was gradually forced up by compradores to 45 taels. In constant touch with the home war demand as reflected by the purchases made by foreign firms in the wool market, the compradores pushed the price up by common consent. Costs of production in the interior never ascended one cent. The wool grower at inland points got very little more for his product than before, although the fiction that it was he who forced the abnormal prices was widely circulated.

By reason of "inside information," readily on tap through the medium of the foreign firms' Chinese office staff, who handled invoices, shipping documents and incidental data, the compradore kept intimate track of just how much profit the firms were making, and used it as a guide for his own quotations. To illustrate how subtle the compradore ring worked, this wool for a while remained at 35 taels a picul, when one foreign firm, anxious to get a big shipment away, offered 37 taels in order to corner as much of the product as possible. The next day firms asking their compradores for quotations received them at 37.

In many other commodities the same practice in restraint of trade was evidenced. Straw-braid, hides, egg products and other of those which found great demand during the war were forced sky high by the compradore ring. A personal interview with several of the leading men, when foreign markets stopped buying, evoked the statement that they would, under no circumstances, bring their prices back to normal. They said they would refuse to sell for two years or more, if necessary, to hold up the prices. They did hold out for a long time, but not two years. The 45 tael wool is now back at 15 and less.

There are firms in China, which broke away from the compradore ring many years ago and have not regretted it. There are firms which have only recently cut out middleman trading and they also do not regret their step. Aided by the facilities initiated by chambers of commerce, whereby instruction in Chinese language is given to employees by competent teachers, traders are gradually beginning to organize staffs capable of placing them in direct personal contact with Chinese markets.

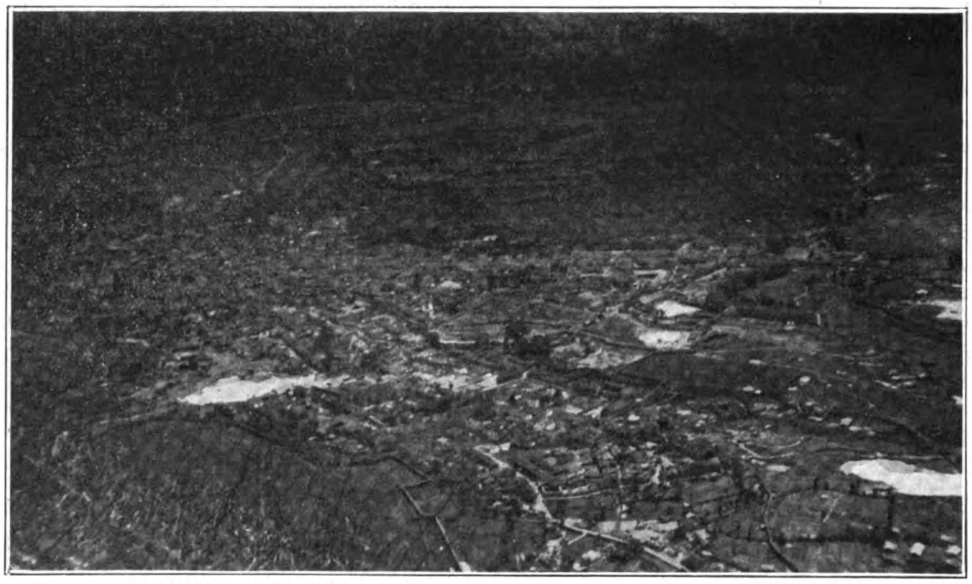
Here and there in the foreign trade group firms are reported to be working independently of compradores. The breaks are becoming more frequent and firms have an increasingly large representation at inland points where the raw products of China are marketed.

China's foreign trade stands to benefit greatly by the change, for not only will foreigners obtain a more satisfactory and closer business connection, but also they will be able to export and import cargo without the unnecessary taxation of ten or more per cent. profits of the compradore, who has long ago outlived his usefulness, such as it was, and whose halcyon days in the business of China were considered long ago to be numbered.

The Kochiu Tin Mines

KOCHIU, a city of about 130,000 inhabitants located in the southwest corner of the province of Yunnan, is the centre of China's tin mining industry. It is reached by the Yunnan Railway from Indo-China, the traveler alighting at Mengtsze and proceeding by chair or pony across the mountains to the tin fields, located for the greater part near the tops of the mountain ranges enclosing the valley of Kochiu. The largest of these mines, ten miles east of Kochiu, is the Ma La Ko, then comes the Huang Mao San and about 100 others of varying extent and outputs. Not long ago the well-known firm of Shewan, Tomes & Company installed a pumping plant to furnish one of the larger mines with water. Their engineer, Mr. William Semple, on his return to England, read a most interesting paper on the "Kochiu Tin District" before the institute of marine engineers, from which the following up-to-date data is abstracted. Mr. Semple says:

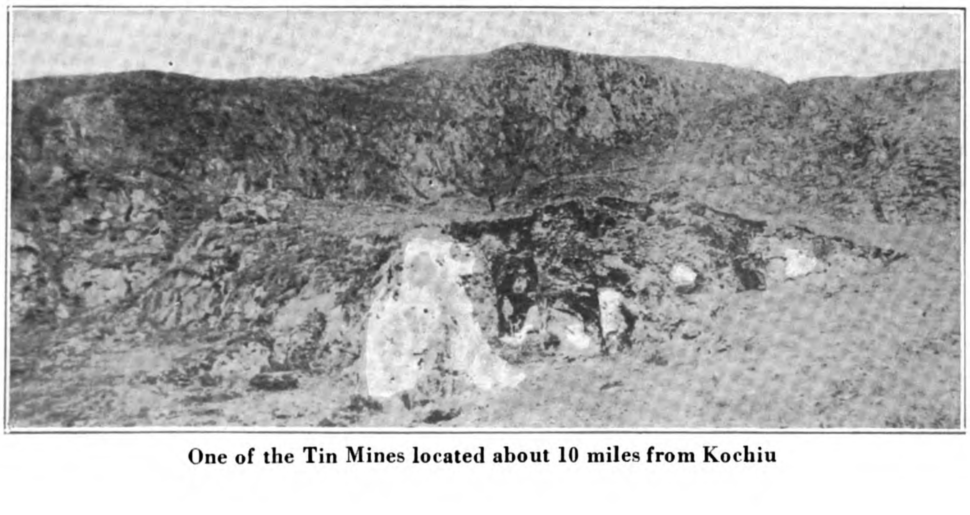
"It is difficult to get any information as to when the tin mining really started, as no authentic records seem to have been kept, and the only data I could find were on a tablet in one of the temples, which gives the date as about 400 years ago. All the mines are situated on the tops of high mountains or in the gulches between them. From my own observation I find that alluvial mining was carried on extensively in the earlier years, the ore being plentiful and easy to get at. It is said by some of the old miners here that when mining was first started it was to obtain silver, and during prospecting the great tin ore beds were discovered, and the abundance of tin ore in this district is really remarkable. Although alluvial mining was carried on extensively the miners opened tunnels in order to search for a finer grade ore, and some of these extend into the mountains from 2,000 to 4,000-ft. from 3,000 to 10,000 men being employed. The largest mining firm here is the Yunnan Tin Trading Co., who are at present introducing a large pumping plant, the installation of which was the reason of my visit, to enable them to work the whole year round and supply sufficient water for ground sluicing on their open mines at Malaga Hill. The ore is earth ore, and when it comes out of the mines it is usually crushed by native methods, either by hardwood clubs or a stone crusher driven by water-buffaloes, then it is all hand-washed, the ore receiving about forty washings before it is smelted. The native furnaces are very interesting; they are built with mud bricks and have a little over a ton capacity. The air-blower, supplying air to the furnace, is native made; the barrel consists of a large piece of timber hollowed out and fitted with a piston, the air suction valves being of buffalo hide and the air discharge going direct into the bottom of the furnace. The whole apparatus is worked by manual labor, and it takes from eight to ten hours to make a cast; the smelted tin is run into sand moulds; the metal obtained runs from 92 to 99 per cent.



General View of Kochiu City, Yunnan province, the centre of the largest tin mining industry in China

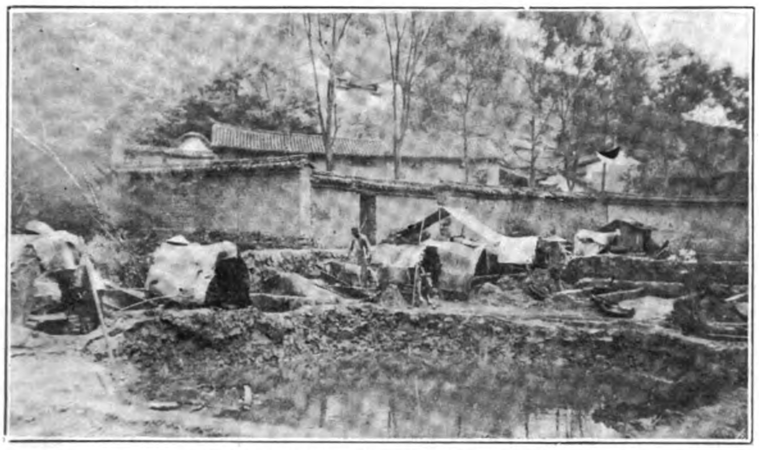
"The Yunnan Tin Trading Co. have a large up-to-date smelting and concentrating plant, which was built by the Germans about ten years ago, and run by their own men. On the outbreak of war the Chinese took it over, and have never used it until quite recently, when they put it under an American administration, and when working fully it will handle 1,000 tons of ore a day.

"The lay-out of the plant is very similar to other mining plants—that is, when the ore is brought down from the mines it is taken by elevator to the top floor, where it enters the large ball mill, and is there crushed to a 16-mesh, afterwards going to a secondary crusher, where it is graded down to 100-mesh; from there it flows down shutes to jig concentrators, where it receives its first washing; from there it flows down to the Wilfley shaking tables below, where it is further washed and graded, the tailings passing out to ponds for re-treatment later on. As regards the percentage of tin obtained from the ore, there was some doubt raised as to being able to make standard tin from the ore obtained at Malaga; the result was that the company brought out an expert metallurgist from America, who spent over three months sampling and assaying the ore, and he got some of the most marvelous results I ever saw. He showed me a sample he had taken from a large cast of tin bars he had made, and after



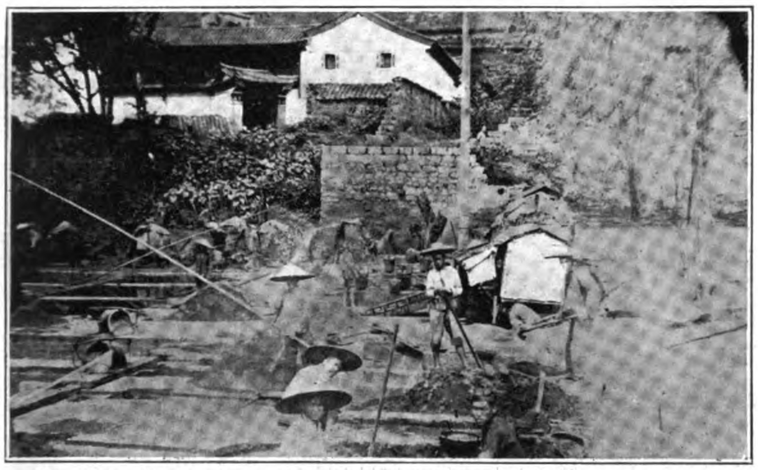
One of the Tin Mines located about 10 miles from Kochiu

VIEWS IN THE KOCHIU TIN DISTRICT



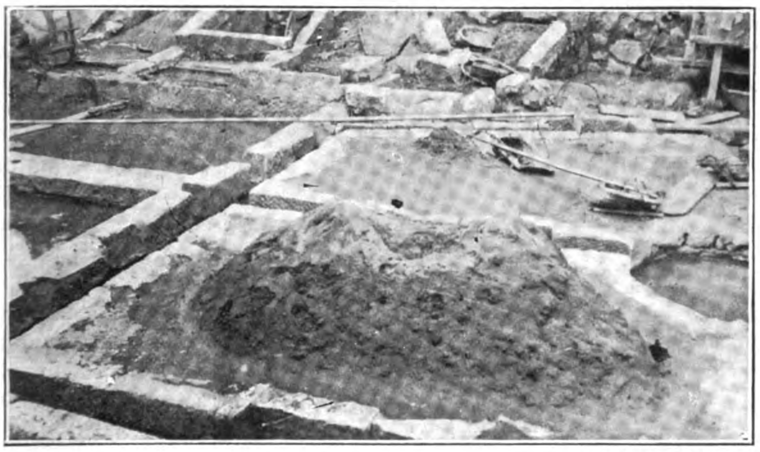
Tin Ore Waiting for the first Washing

Tin Ore Washing Troughs



Washing Tin Ore in the Compound of the Kochiu Tin Trading Co.

Washing Tin Ore



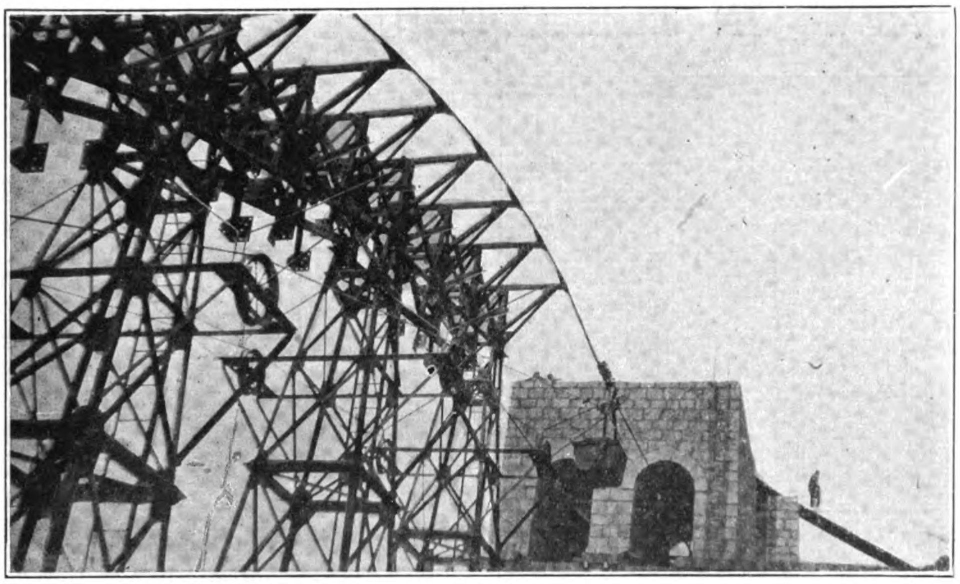
Washed Ore ready for the Smelter

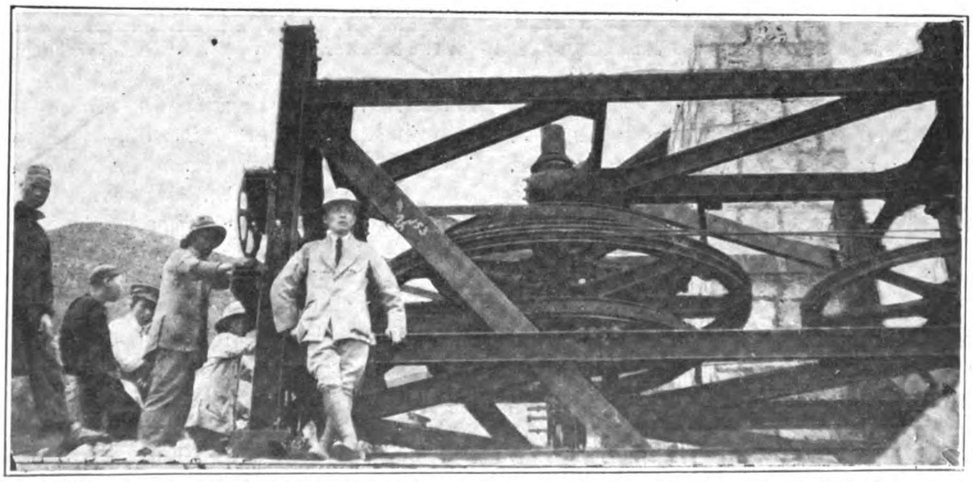
assaying them showed the high purity of 99 per cent., and he proved that standard tin could be made from these ores. He made out a complete set of plans for a new lay-out of their smelting and refining plant, which I understand they are going to put in next year. The smelting furnaces at present are on the Siemens-Martin principle, six in number, of ten tons capacity each, one gas generator supplying two furnaces. At present they only run two furnaces, averaging about two casts a day. The native furnaces are of the beehive pattern, and built of mud bricks and average two tons capacity, wood charcoal being used as fuel and the air blast hand-driven. These furnaces work very well, being easy to build and keep in repair.

"The conditions at the mines for boys and men are practically the same, and ventilation most inadequate, being absolutely devoid of fans. Whether there are any mining laws relative to this province I don't know; there must be, as there is a director of mines in Yunnanfu, but I have never seen them, the native methods of mining being used for centuries. However, the administration has all been changed this last year for the better, as many Chinese are educated in American mining colleges, and are quite used to the existing conditions. I understand they contemplate sinking a shaft 1,000-ft. deep to connect into the present mine tunnels at different levels, and also putting in a proper ventilating shaft with fans; also rebuilding all the housing quarters with well-equipped hospitals and medical attendance, which is much lacking at present. When these alterations are carried out it will be ideal for the miners, as they will then be able to work regular hours, and all the ore will be hoisted to the surface in mine cars and dumped into bins. At present, what

causes the high mortality among the miners is coming out of these hot channels dripping with sweat, carrying their loads of ore, and being very thinly clad the cold air simply catches them, and they develop lung trouble, which, if not checked in time, turns into tuberculosis, and once they get that they only last about a week. They have no set hours of work at present; just simply so many loads of ore to bring up, the average being five; over and above that they get a bonus of 10 cents a load. These loads for the men average 133-lbs., and for boys about half that, or according to their strength. So you can imagine what that means coming out of a tunnel 4-ft. square and 2,000-ft. long, the floor having an incline of 45 degs. and the ore dump about half a mile from the mouth of the tunnel. As far as I understand their wages average from 50 cents to $2 a day, according to their time of service. All the miners are well fed, but that does not compensate for the hard conditions they live under at present.

"The greatest trouble they have is in the refining of the tin, due to the percentage of lead and arsenic being high. Formerly it used to be shipped to Hongkong, and re-melted and refined before being put on the market, thus adding unduly to the cost. To overcome the difficulty they have engaged an American mining engineer, as well as a smelting specialist, to give attention to all the work near the mines and bring the tin up to the required standards to compete in the open markets of the world. Whether they will [introduce modern methods of mining remains to be seen. I doubt very much if it would pay owing to the large overhead expenses in bringing machinery up the mountain, transportation being a very difficult and dangerous problem judging from my own experience in bringing the pumping machinery across. The cost of transportation alone was $40,000. This gives an idea of the very wide margin of costs firms have to work upon when doing business in this province. But when once the Chinese wake up to that fact with the possibilities of development, and put down good roads and make the interior safe for foreigners to live in (although they will certainly need foreign help to develop their resources and make conditions good generally all round), then the future of this province will become very bright."





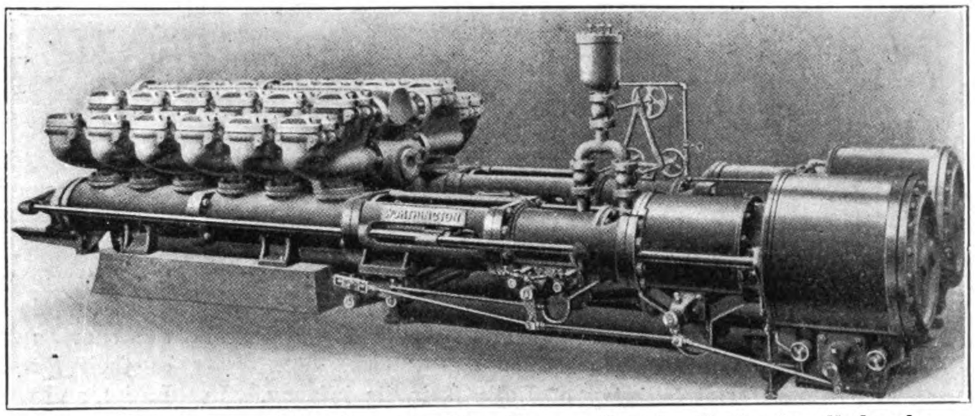
Three Views of the Cable Transmission Line conveying Tin Ore from the Mines to the Smelter

The smelter above referred to, operated by the Yunnan Tin Trading Company was founded shortly before the outbreak of the Chinese revolution in 1911. It is an official provincial enterprise under the direction of the finance bureau of the Yunnan government and like all Chinese official concerns has had its share of financial troubles during the past ten years. At one time it attempted to relieve the financial pressure on the provincial government by issuing its own bank notes, but in face of severe opposition was compelled to withdraw the issue. As the official company also works the rich Ma La Ke Mines it has managed to clear a fair profit and devote considerable funds to the betterment of its properties. One of these improvements, cutting down the excessive costs of transportation was the installation of an aerial conveyor to carry the ores from the mines to the smelter, and the pumping plant referred to by Mr. Semple, which is located at the foot of Lao Tu-shan. The plant consists of two triple-expansion Worthington pumps designed especially for this work by Mr. E. G. Norman, their engineer for China, and sold through Shewan, Tomes & Company. These pumps have a capacity of 7,000 tons of water per 24 hours delivered against a head of 3,000 feet. The water is taken from a reservoir of 3,000 cubic metres capacity fed by a small canal 23 miles long which carries the water from the Cha-tien river.

In addition to the larger smelter there are a number of the native variety, which produce an aggregate of 10 to 15,000,000 kilos annually, of which, the official smelter turns out

about 998,400 kilos. The highest output of the big smelter was 1,664,000 kilos. There are about thirty of the native smelters in the Kochiu region, which operate for only about four months in a year.

The construction of the smelters is very simple; the bricks being obtainable on the spot, they are not very costly to build. The blast is supplied by a wooden air-pump with piston packed with feathers, the usual instrument for providing blast in old Chinese forges and furnaces. Each furnace is run by ten men (five per shift) and a foreman.



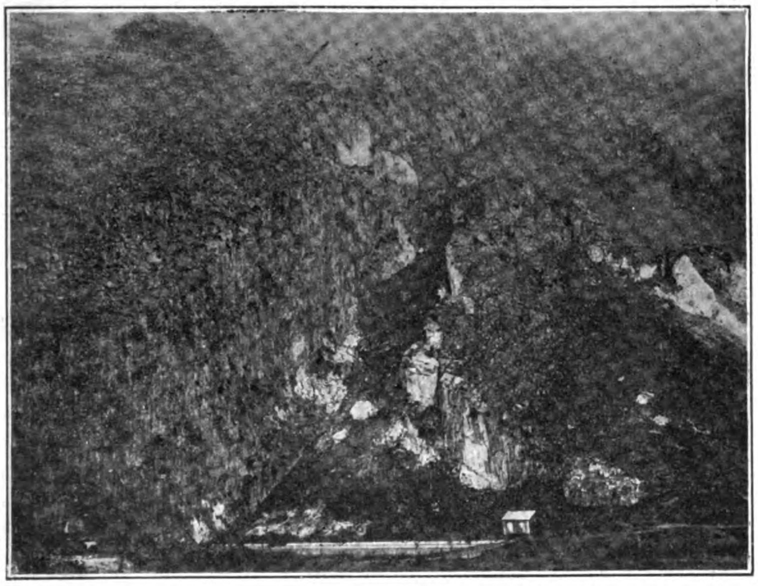
Type of Worthington Triple Expansion Mine Pressure Pumping Engine, installed at the Reservoir, delivering 7,000 tons of water per 24 hours against a head of 3,000 feet

Six-hour shifts are customary. Three men work at the blower, one man sees that the metal runs well from the tap-hole. One man is engaged in feeding the ore and charcoal. In addition to these, there are two men engaged in pouring the metal. The slags from the furnaces are crushed and washed to extract the metallics. The remainder is re-smelted with ore until considered free from tin. It is then dumped as conveniently as possible anywhere in the town.

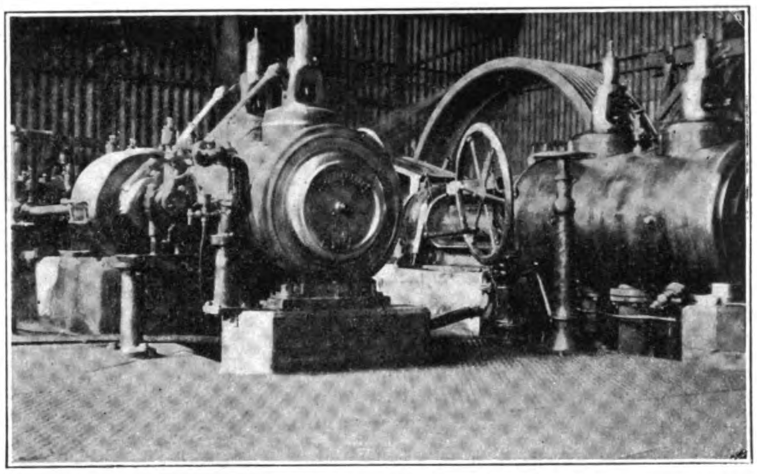
There is no attempt at refining the metal at Kochiu. The chief impurities are iron, often present to the extent of 1 per cent. and lead, usually less than a quarter of 1 per cent., though the metal from some of the mines may contain over 50 per cent. of lead.

Each slab, before leaving Kochiu, has to receive official "chops" or marks showing the slab has been weighed, and that the requisite taxes have been paid on it. When the slabs reach commerce, they usually also have been marked with the name of the furnace in which they were smelted, the merchant to whom they belong, and the transit agent through whose hands they have passed.

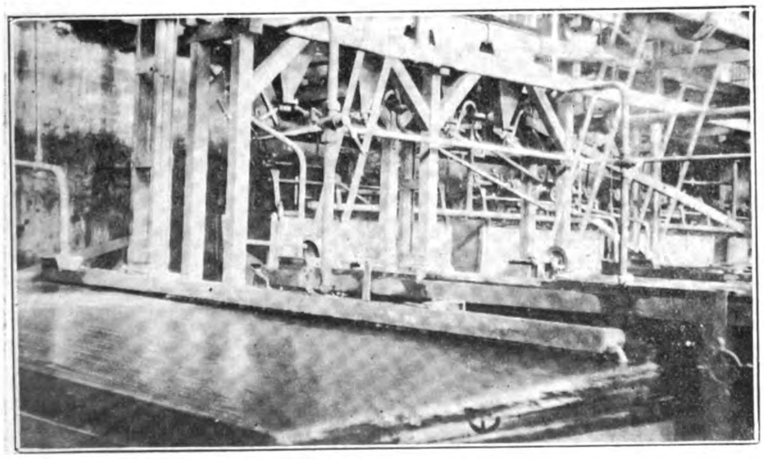
The miners pay no direct taxes to the government. A small local tax is sometimes laid upon concentrates for the upkeep of the roads.



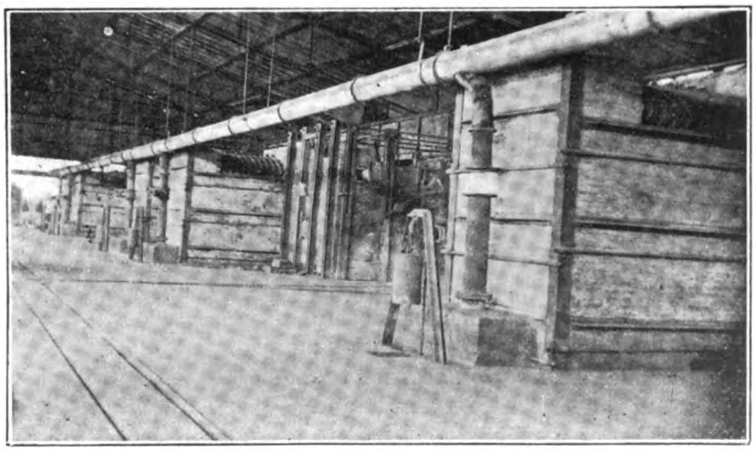
Site of Pumping Station to Supply the Ma Lake Mines, located over the top of the Mountain, 3,000 feet above the Reservoir



German Power Plant at the Kochiu Smelter



Ore Washing Plant



Siemens-Martin Tin Smelters

Iron and Steel in India

WITH the permission of the director of the geological survey of India, Mr. Cyril Fox, B. SC., M.I.M.E., F.G.S., an officer of that department, has contributed to the *Mining Journal* of London an article on "The Trend of the Mineral Industry of India." An advance copy of the article is published in *The Indian Trade Journal*, from which we extract the following notes on iron and steel production:—

The iron and steel industry of India is in its infancy. In view of the developments that are taking place, and from a knowledge of the vast deposits of high-grade hematite in the belt of country from Mayurbhanj state westward to the states of Keonjhir and Bonai and the Kolhan sub-division of Singhbhum, this industry must eventually become of very great importance to India. Although much has been written of the Bihar and Orissa iron ores, it is, perhaps, not fully realized how immense are the quantities of available high-grade ore. Both the quality and quantity of hematite in this part of India are calculated to exceed the great American deposits of the Lake Superior region in Minnesota, Wisconsin and Michigan.

Although there are, at present, only two large iron works which are producing iron and steel in India, a third is rapidly being erected and others are projected.

TATA IRON AND STEEL.—Of the existing companies (1) the Tata Iron and Steel Works are established at Jamshedpur, in Singhbhum (B. & O.), a few miles north of Tatanagar, on the main B. N. Ry. line to Bombay. Originally, this company relied on the iron ores of Gurumashisni (Mayurbhauj state), but the neighboring deposits of Okampad and Badanpahar are being opened up. They obtain their limestone from Gangpur state, where there are two occurrences, near Panposh and Bisra. Although the quality of this flux is very good, the material is not cheaply obtained. The rock is not quarried, but mined, and, as may be imagined, the limestone question has not yet been satisfactorily solved. Their coke is made from Jherria coal. The production of these works has been (1919-20 exports from Jamshedpur) 50,000 tons pig iron, 75,000 tons of steel rails, and 60,000 tons of bars and girders, valued in all at 5 crores of rupees. Two more blast furnaces capable of producing 1,000 tons of pig iron a day, a new duplex steel plant capable of an outturn of 1,000 tons of ingots a day, and mills for plate, sheet, bars and rail and structural work, have been erected, and are practically ready for blowing-in and working.

To utilize the finished iron and steel products of their mills a number of subsidiary companies are being established at Jamshedpur: The Calcutta Monifieth Works, for the manufacture of machinery for the jute industry; the Enamelled Ironware, Ltd., for the manufacture of domestic utensils and other types of goods; the Tinplate Company of India; the Agricultural Implements Co., the Indian Steel Wire Products, Ltd.; the Enfield Cables Co.; and the Hume Pipe and Construction Co.

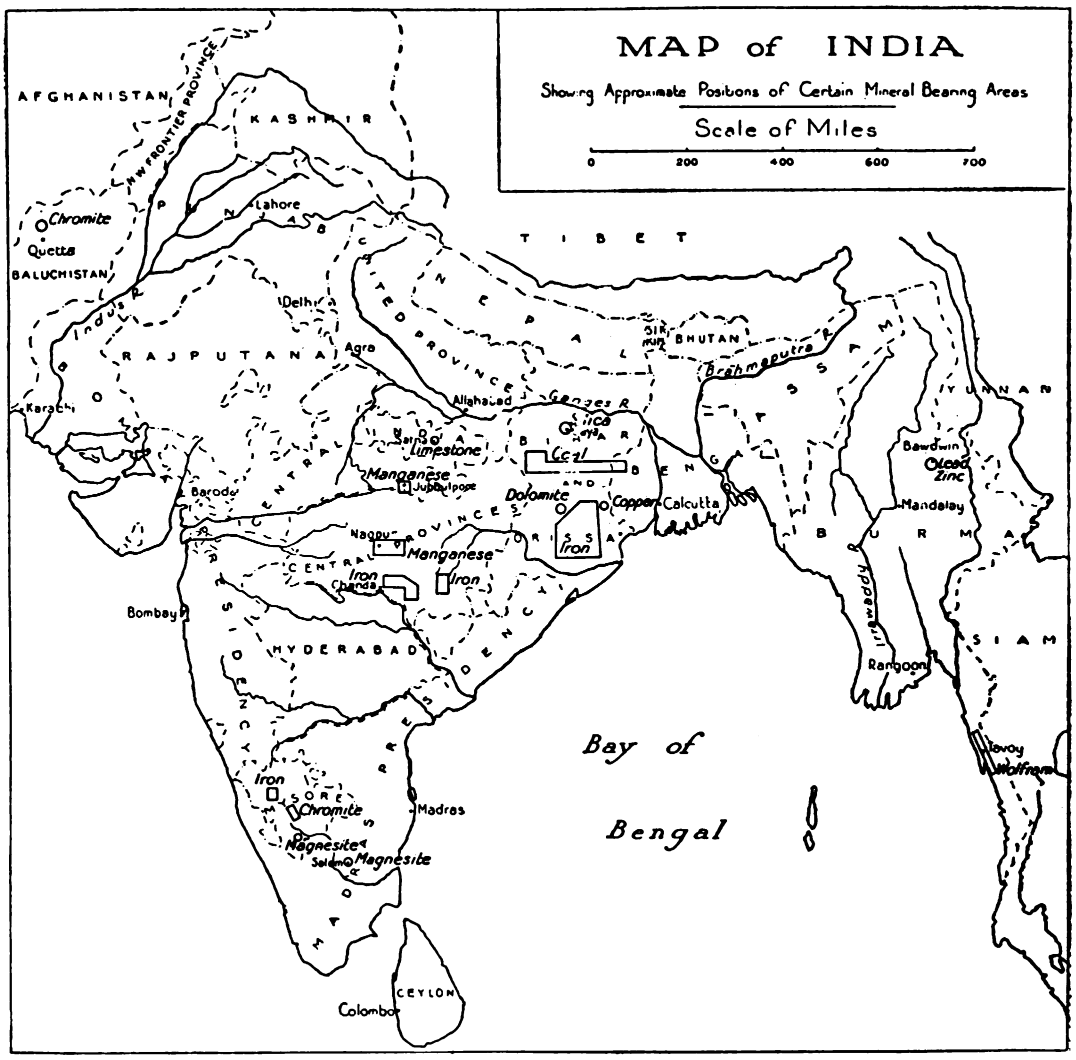
(2) THE BENGAL IRON CO., LTD. have their headquarters at Kulti on the Bengal side of the Barakar river. They obtain their iron ores from north-west Kolhan (a subdivision of Singhbhum) and Keonjhir state. The coke is made from Jherria coal and from the company's collieries at Ramnagar, near the works. Most of their limestone comes from Sutna (Rewa state, in central India), and partly from Bisra. They produce daily about 450 tons of pig iron, but utilize most of this in making castings of special types, chiefly railway sleepers and chairs. It is not clear when this company propose to re-establish their output of ferro-manganese.

(3) THE INDIAN IRON AND STEEL CO. are erecting works at Hirapur, on the railway between Asansol and Adra in Bengal. They will be supplied with iron ore from Gua in Kolhan, along the new railway extension, which leaves the main B. N. Ry. line at Amda and passes through Chaibassa to Jamda. The flux (limestone) is obtained from Gangpur state, and the coke is to be made from the coal of the local fields. At first the company will restrict itself to the production of pig iron, the present plant being designed for a daily output of 600 tons.

In addition to these there are a number of new companies.

(4) THE UNITED STEEL CORPORATION OF ASIA, LTD., was registered in India in December, 1921 with a capital of £10,000,000, at 6½ per cent., by Messrs. Bird & Co., of Calcutta, and Messrs.

(Continued on page 579)

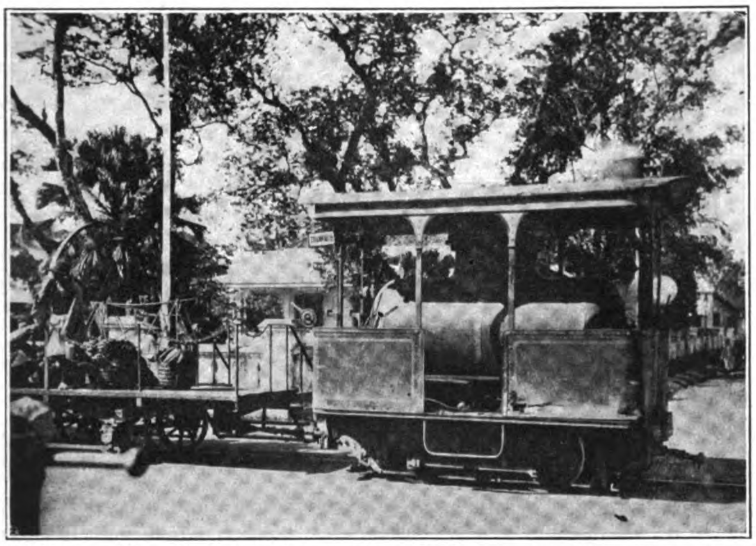


(Mining Magazine)

N. E. I. Railway Electrification

ALTHOUGH the plan for the electrification of the Java State Railways main line from Batavia to Sourabaya has been temporarily abandoned on account of financial depression, the project for the electrification of 50 miles of inter-urban lines in the vicinity of Batavia is rapidly nearing completion. An appropriation of 5,000,000 guilders is in the hands of the electrification department of the state railways, who, in connection with the department of waterpower and electricity, have outlined a three years' program.

According to Dr. G. de Gelder, head of the electrification department, the first of the new electric lines will be in operation next year. Although only a stretch of ten miles, connecting Tandjong Priok, the harbor of Batavia, with Meester Cornelis, one of the principal residential districts of the vicinity, the use of electric power will mean not only a great saving in fuel expenses, but an enormous saving of time for the commuters of the capital city. The European population of Batavia lives either in Meester Cornelis or Weltevreden, and are forced to make the daily trip to their business houses in Bataviaor Tandjong Priok by railway or steam tram. The present time for a trip from Priok to Cornelis one hour and a half. The electric cars will make the trip, including stops, in 24 minutes. Ten minute service will be given at first, with five-minute service to be offered if the traffic warrants it. The whole length will be double-tracked.



"Hohenzollern" Fireless Locomotive which now furnishes the motive power for the greater part of Batavia's inter-urban service. The locomotive is charged with super-heated steam at the power-house in Kramat, and under ordinary conditions will make the round-trip without difficulty. In case of a cold thunder-shower, or a traffic jam, causing the journey to occupy more than an hour and a half, the steam gives out and the stalled engine has to be rescued by the next one along.

The two other sections of the electrification plan, to be completed in 1924 and 1925, include lines from Tandjong Priok to Batavia, and from Batavia to Weltevreden, Manggarai, and Meester Cornelis. The entire system will be double-tracked, standard gauge.

The source of power will be hydraulic. The department of waterpower and electricity, which has surveyed the entire island for hydro-electric stations to be built as the electrification scheme materializes, has completed a plant at Tji Badak near Soekaboemi, for the inter-urban lines. The power be carried the 70 miles to Batavia at 70,000 volts, three-phase high-tension current. Two sub-stations at Meester Cornelis and Antjol, will transform it into 1,500 volts D.C.

Bids for cars, which will be of the overhead pantograph type, have been received from Dutch, German, Swedish, Swiss, British, and American firms. Although the awarding of contracts has been practically decided, confirmation must be received from Amsterdam before the awards are published.

"I can say unofficially," said Dr. de Gelder, "that a large share of the work will fall to American bidders. German bids were low, as was unexpected, but we were greatly surprised at the low figures quoted by American establishments."

The first order will include 20 motor units of two cars each, a number of electric locomotives not yet decided, and equipment for the sub-stations.

As soon as funds are available, work will be begun on the electrification of the mountain lines of Batavia and Preanger provinces. The need for electric service from Batavia to Buitenzorg and Bandoeng has been declared "urgent" by Dr. de Gelder, not only through the necessity for faster service, but because of the large amounts of fuel burned by the steam locomotives of the mountain lines.

The larger electrification projects have been laid aside until more prosperous times, although northern Celebes is being surveyed for possible electric lines in Minahassa.

Iron and Steel in India

(*Continued from page 578*)

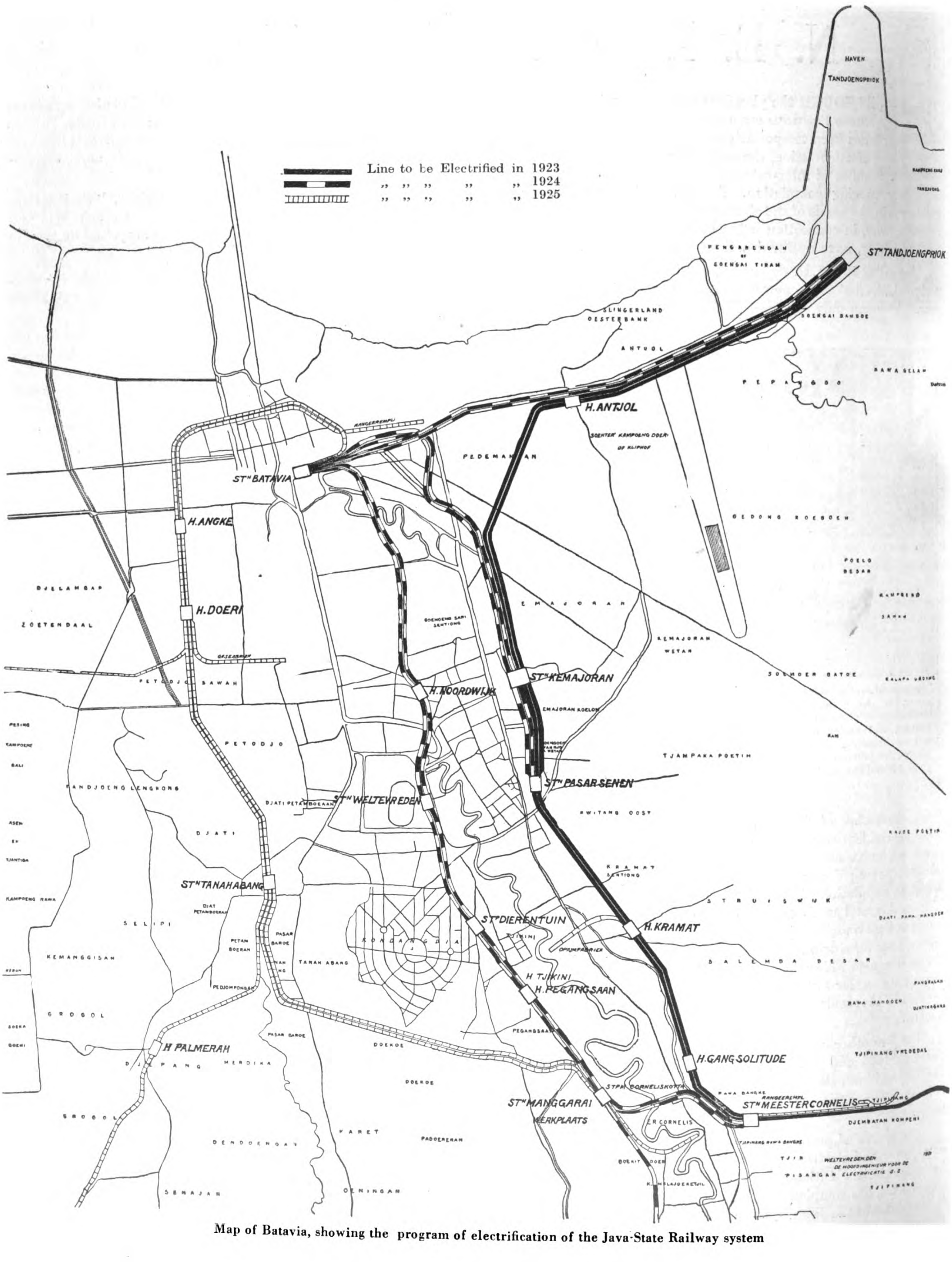
Cammel Laird, of Sheffield and London. The works are to be erected at Manoharpur. A new railway line is to connect the works northward, through Hesla, with Hutar and the Karanpura coal-fields. The iron ore will come from the Keonjhir-Bonai area, and the limestone, probably, from the Gangpur region. The immediate erection of plant capable of producing 300,000 tons of pig iron and 200,000 tons of finished steel annually is contemplated. This output will later be increased to 700,000 tons of pig iron and 450,000 tons of finished steel. The erection of the works will be carried out in three stages of development, during which the B. N. Ry. will have to provide additional rolling-stock on the following scale: First stage, 492 waggons, with 9 locomotives; second stage, 4,113 waggons, with 74 locomotives; third stage, 7,723 waggons, with 139 locomotives.

(5) THE EASTERN IRON CO. is to be erected in the vicinity of the Jherria coalfield, and will obtain its supplies of ore and flux from much the same localities as the Indian Iron and Steel Co.

(6) THE KIRTYANAND IRON AND STEEL WORKS, near Sitarampur, in Bengal, is to be established for the production of iron and steel castings in a smaller way.

When these several companies are in working order they would have a total estimated output of 1,500,000 tons of pig iron and 1,000,000 tons of steel annually. Production on such a scale will result, obviously, in the erection of mills for the out-turn of finished iron and steel materials, such as sheets, plates, bars, joists, etc.

Messrs. Thornycroft have already established a works in Calcutta, and various existing firms, such as Messrs. Burn & Co., Martin & Co., etc., are capable of carrying out steel structural work on a large scale. Other engineering works for the manufacture of machinery, such as the various railway waggon and locomotive shops, are enlarging the scale of their operations, and new enterprises are certain to follow with the revival of trade.



Map of Batavia, showing the program of electrification of the Java-State Railway system

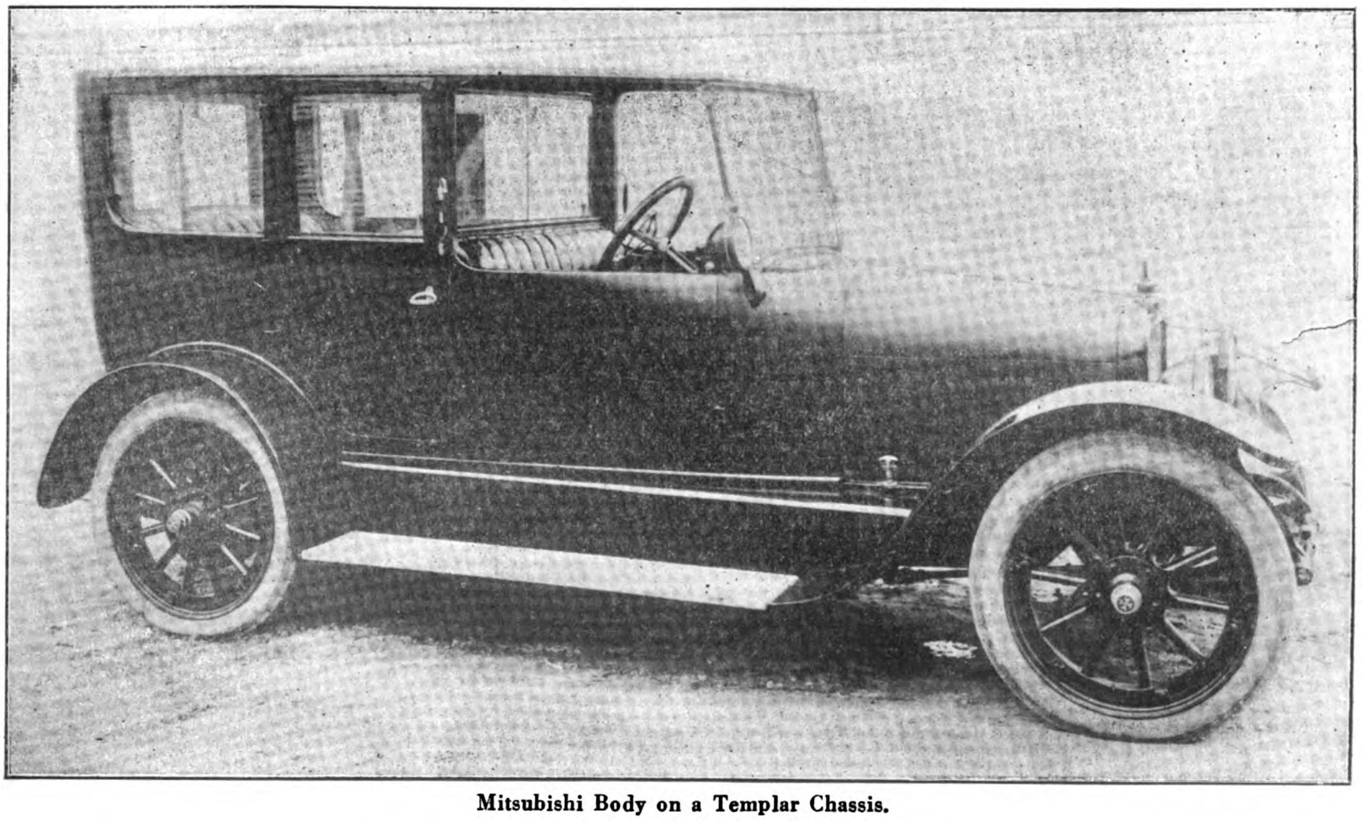
The
FAR EASTERN MOTORS
MOTORING-AERONAUTICS-MOTOR BOATING

Motor Manufacturing in Japan

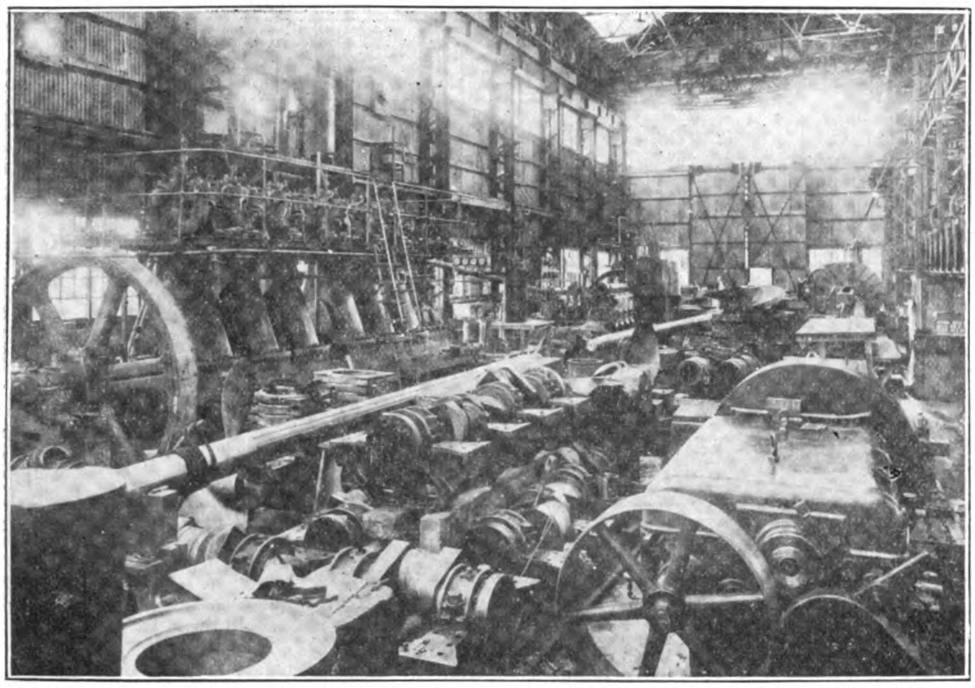
Interview with William I. Irvine, U.S. Trade Commissioner

MR. WILLIAM I. IRVINE United States trade commissioner, now touring Asia investigating and reporting on the automobile markets of this part of the world for the benefit of American manufacturers, has concluded a very comprehensive survey of the Japanese field. After some time spent in Korea, Manchuria and Central China, he is now on his way towards the Malay States and Java. In an interview given to THE FAR EASTERN REVIEW Mr. Irvine gave his opinion of the possibilities of motor manufacturing in Japan. Asked whether in his opinion it is possible for Japanese manufacturers of autos and trucks to compete with American and European makers, Mr. Irvine said that at present "two methods of motor vehicle manufacturing are being tested now in Japan : assembling with imported units, and the manufacture of the complete vehicle within the country. The success of both are now in the balance, and the results obtained will probably decide the question for those manufacturers in other lines who are giving serious thought to this industry. Both tests are being made with cars the answer to the truck question having been given, it being that, on the whole, trucks cannot profitably be built to meet the competition of American vehicles.

"Assembling is now being done by the Ishikawajima Shipbuilding and Engineering Co. Ltd., of Tokyo, of the British Wolseley. The parts are imported from England and are assembled under the supervision of Britons by Japanese workmen, some of whom have been trained in England. Present production is said to be ten of the 10 horse-power type per month, but this could not be confirmed. The specifications are : 4 cylinders $2\frac{9}{16}$-in. by $5\frac{3}{4}$-in. with 1,700 RPM developing a speed of 40 miles per hour. Tread 3-ft. 10-in., overall length of chassis 10-ft. 7-in., overall width of chassis 4-ft. 8-in. allowing a body space of 5-ft. 5-in. by 2-ft. 3-in. with a 99-inch wheelbase on detachable 28-in. wheels. The total



Mitsubishi Body on a Templar Chassis.



Kobe Works of the Mitsubishi Company. Motor Department; Erecting a 400 H.P. Diesel Engine for Electric Generating Set.

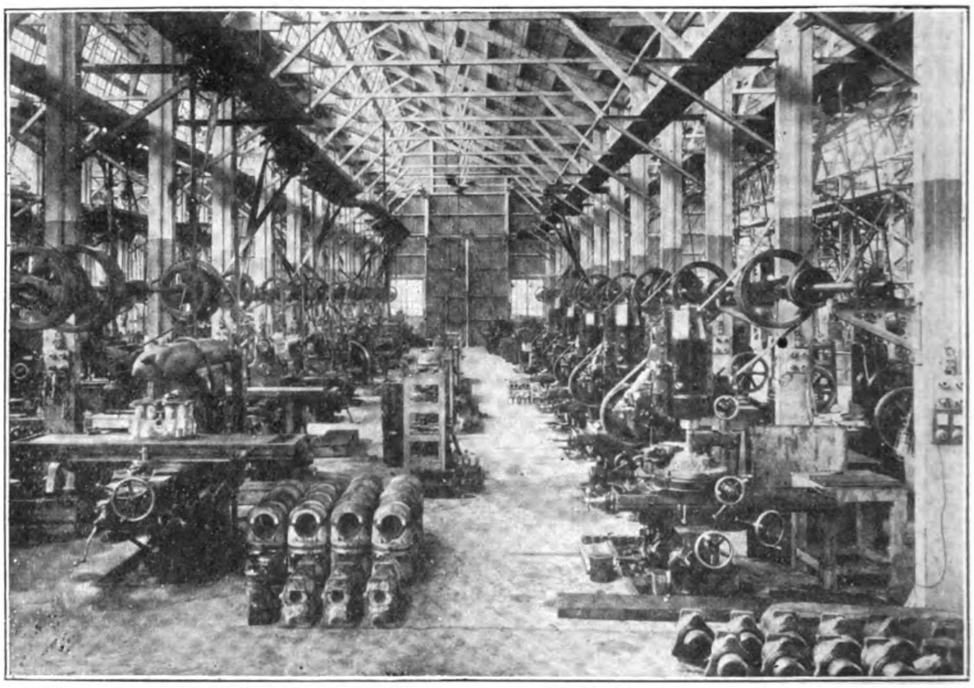
588. The company was organized with a capital of Y.1,250,000 and a site on the outskirts of Osaka was selected on which has been built a modern factory of the saw-tooth type of construction. The buildings are equipped with the latest automotive machine tools imported from America and there are now being made in the buildings parts which in America are ordinarily purchased in the open market, such as bolts, nuts, screws, etc. In addition to the ordinary machine tools such as lathes, stampers, drills, punches, milling machines, gear cutters, etc., the factory has its own forge and heat-treating furnaces, a completely equipped wood-working shop and a paint shop with a spraying machine. The only parts it purchases are tires, rims, spokes, carburetor, magnetos, lamps, generators, friction wheels, chains, sparkplugs and wiring. These are imported from the United States as are the cold rolled and alloy steels as the quality of the latter made in Japan does not meet the requirements of the company.

"Work on the factory was finished August 1921 and up to March 1922, there had been

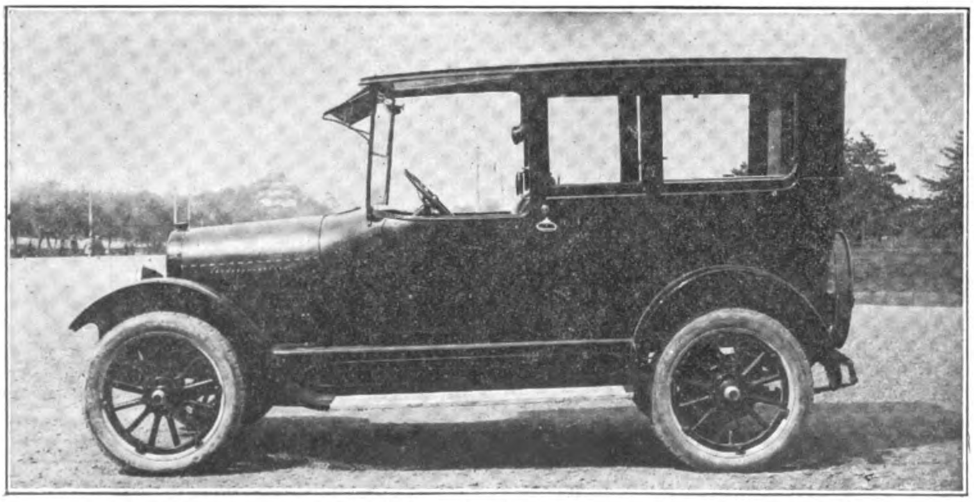
width of the chassis is 900-lbs. Equipped with electric starting and lighting, it sells for about Y.7,000 (G. $3,500.00). The company also announces that it will assemble the 15 and 20 horse-power type.

" A far more important enterprise from the competitive point of view are the efforts of the Jitsuyo Jidosha Seizo Company, Ltd., of Osaka. Here is a company organized solely for the purpose of manufacturing a car especially suited to the operating conditions of Japan, which has erected a completely equipped automobile factory in which every single unit can and is, with a few minor exception, built. After two years of preparation and experiment, production has begun and if schedules are adhered to, serious competition will be offered American light cars, and fields as yet untouched will be opened.

" The company was organized two years ago through the efforts of an American automotive engineer. His original idea was to build a motor rickshaw but learning that passengers would not ride by the side of the driver he changed his ideas and designed the vehicle shown on page



Mitsubishi Kobe Works : Motor Shops.



Buick Limousine: Body Built by the Yanase Automobile Co., Ltd., Tokyo.

produced 120 machines of which 100 were manufactured during the first three months of 1922. The production capacity is seventy a month and it is believed that this number will be produced regularly within a few months. At the time of the writer's inspection of the factory, production was being delayed by the failure to receive promptly the supply of friction wheels from America. It is the plan of the company to keep sufficient stocks ahead to prevent a similar occurrence in the future.

" The machine which is known as the 'Forham,' named after the designer, is a cycle car, two cylinders V-type air-cooled motor with a 3-inch bore and 4-inch stroke. It has a friction drive with chains to the rear wheels, with three forward speeds and one reverse with an emergency gear box cutting ratios in half, thus providing

three extra low speeds for hill climbing. The wheel base is 72 inches and the tread is 38 inches giving a turning radius of 12 feet on the four-wheel type and 9 inches on the three-wheel machine. The wheels are equipped with standard 28 by 3 American tires. The car has a speed of 30 miles an hour with a fuel consumption of 30 miles to the gallon which the designer says is equal to 50 miles on American roads. The weight of the car with body is 800-lbs. The selling price of the three-wheel type with passenger body is Y.1,550 (G. $750.00) and Y.1,650 (G. $850.00) for the four-wheel type. Several type of delivery bodies are made which sell for Y.1,450 (G. $725.00). The selling prices appear to have little relation to the cost of production, and it seems certain that the company has in mind to undersell a popular American car which has been most successful in the country districts.

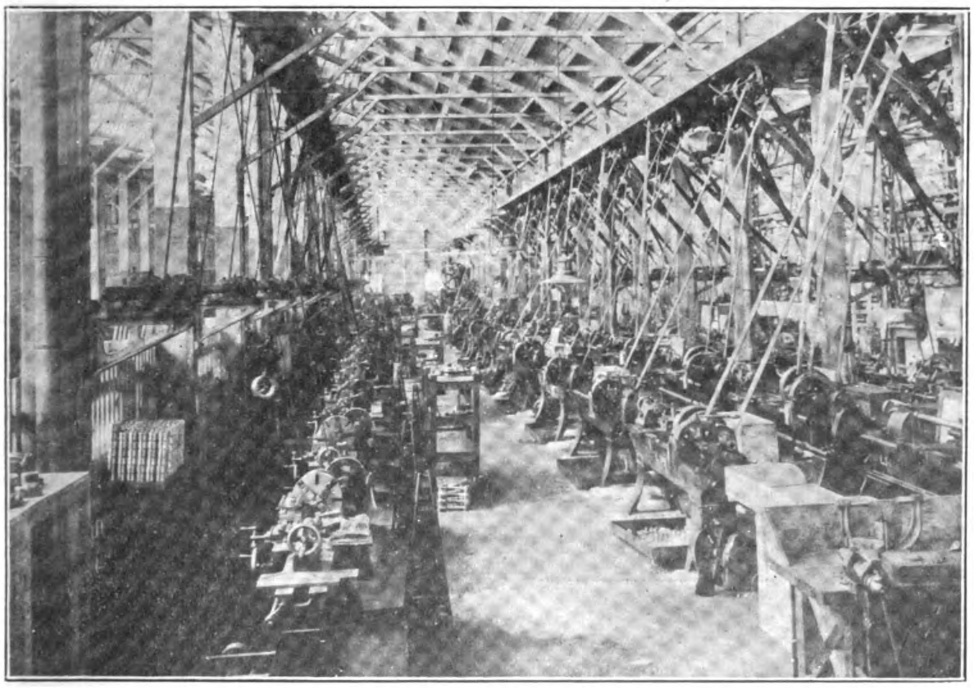
New Building of the Yanase Automobile Company, Ltd. Tokyo; showing 4 Buicks Model 22-49 delivered to the Japanese Army and one Cadillac. Two-thirds of the ground floor space is devoted to showrooms and the rest to accessories and parts.

" A test ride proved the adaptability of the car to road and traffic conditions but also demonstrated that it was very uncomfortable, that it is very noisy and that gear changing was accompanied by jerks. The riding quality was not equal to any American car and this was admitted by the designer who maintains that the car will not compete against the average American car as it was designed to supply a need for a fast vehicle on the narrow roads of the interior.

" At the time of the inspection no selling organization had been completed, the attitude of the directors being to make a number first and then build a selling organization. A few cars had been shipped to Tokyo and sold but the car by no means was being pushed by sales campaigns. Until the army annual test held in May of this year it was not generally known among the Tokyo dealers. Its appearance at the test was a surprise to many.

" Whether the company will be able to go forward is an open question. The designer and his assistant, who are also in charge of production, have been working under a contract which will expire in a few months and it debatable whether it will be renewed. The contract called for the designing of the car, the supervision of the erection of the plant and the starting of production. Now that these have been done the owners are anxious to take full charge and place Japanese engineers in the executive positions and be responsible for productions although the latter, it is said, have had no experience in automotive machine production. The Americans tell a highly interesting story of the trials and tribulations of getting the plant under way and even at the present time they are compelled by necessity to 'take a hand' at work which requires extreme mechanican nicety. All the workmen have had to be trained as naturally there is a scarcity of skilled mechanics for automotive work. The present force has to be supervised very carefully. The engineers state that although individual wages are lower than for the same class of workmen in the U. S., a greater number are required to produce the same amount of work, so that there is little difference in labor costs. Unquestionably the enterprise will bear watching.

"Attempts have been made by others to manufacture but the ventures have not been successful. The Mitsubishi Internal Combustion Engine Manufacturing Co., Ltd., has erected a large modern plant at Nagoya for the major purpose of manufacturing aeroplane engines, it having secured the manufacturing rights of the Hispania-Suiza for Japan. This company is controlled by the Mitsubishi family, one of the two largest family firms in Japan. with ramifications that touch almost every activity in the country. At this plant, operating under a government subsidy, 20 trucks and 6 cars were manufactured about a year ago, but the cost was so far in excess of what vehicles of similar quality could be purchased in the open market that the manufacturing was discontinued. According to Dr. K. Ito, managinag director of the company, who has made a very extensive study of production methods of automotive factories in America and Europe, the Japanese market does not warrant, at present time, the investment of capital in automotive manufacturing enterprises. To manufacture on a scale that would bring the unit cost down to a comparable figure with American makes would require a home consumption of at least 1,000 cars a year, a figure which seemed impossible of attainment for a single make for a long time. To make up this figure by exporting he did not think possible for the reason that a car which a Japanese company could sell for Y.3,000 (G-$1,000.00) could not compete in quality successfully with American



Mitsubishi Kobe Works: Motor Shops.

THE SHIBAURA WORKS OF THE YANASE AUTOMOBILE CO., LTD.

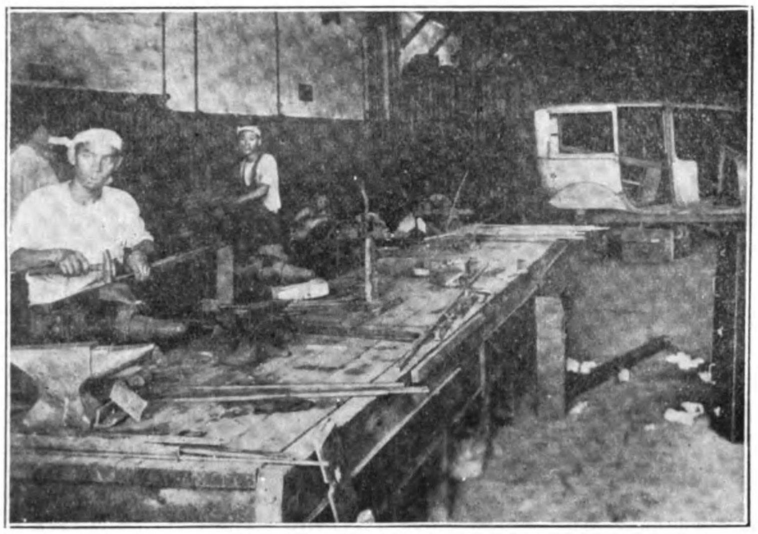
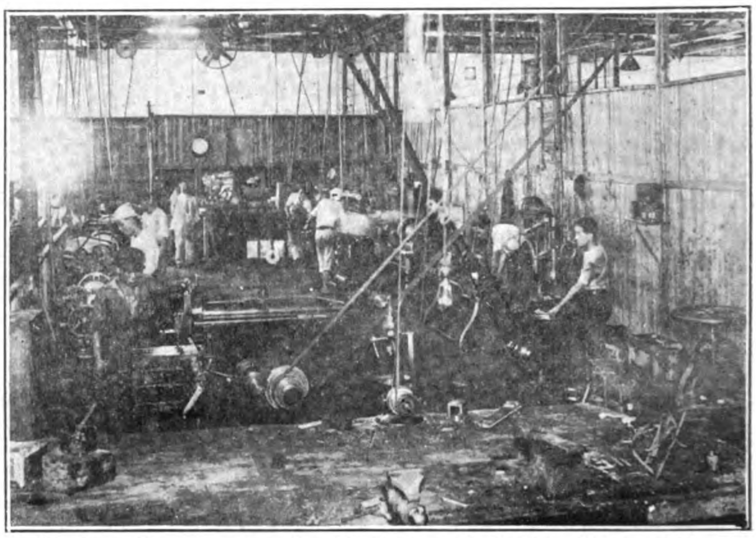
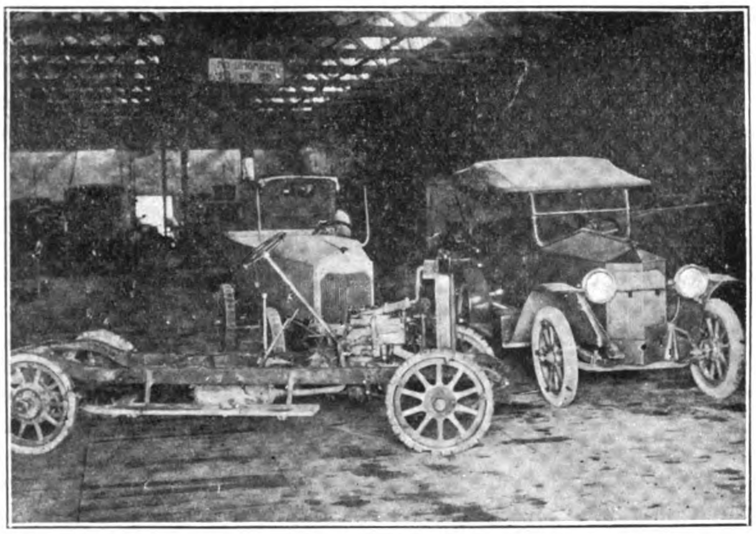


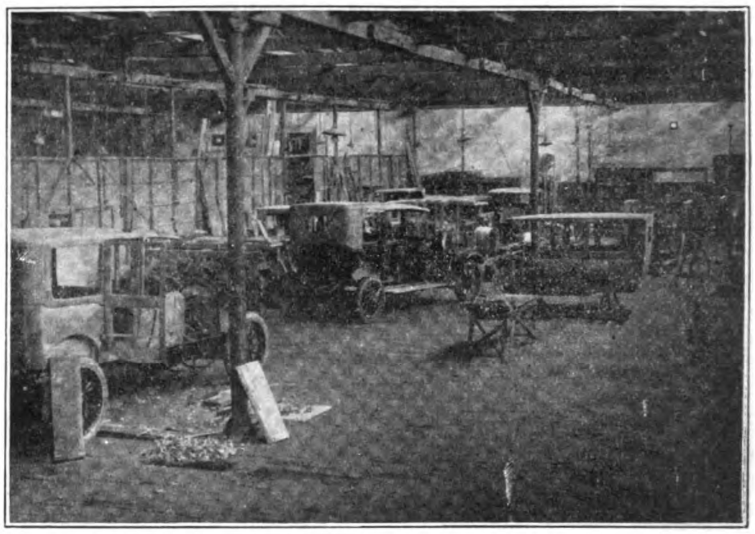
Plate Iron Shop.



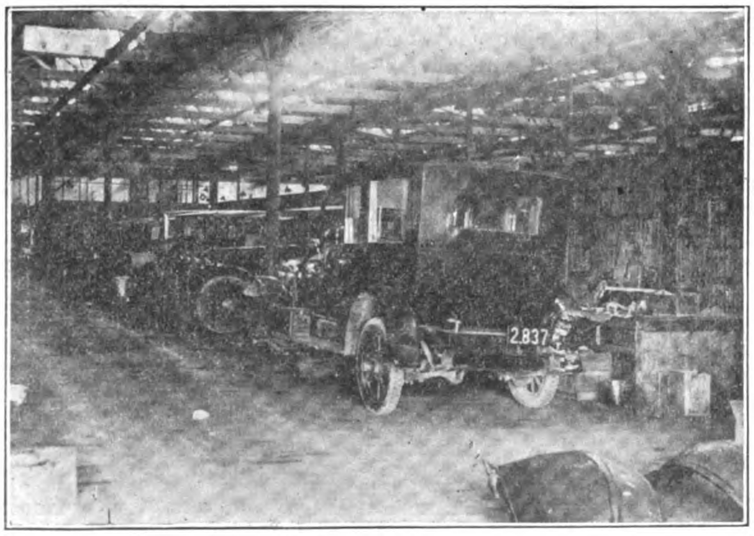
Machine Shop, equipped with Universal Miller, lathes, drills, grinder, planer and boring machine.



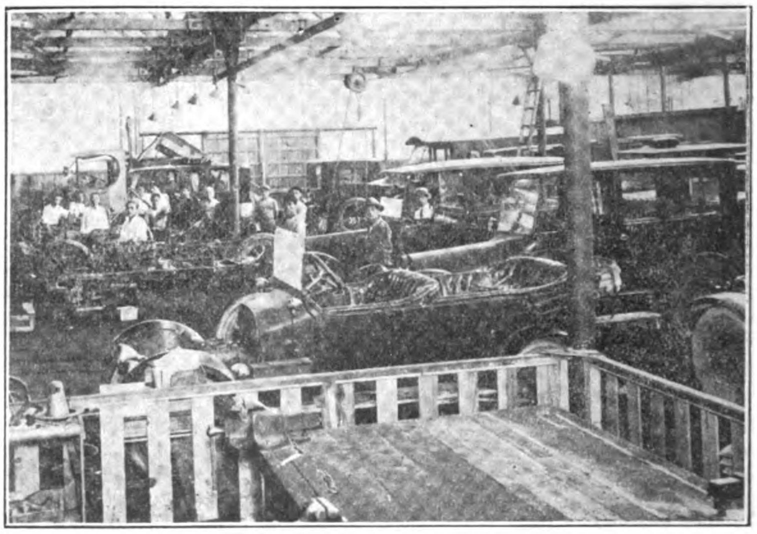
The Machine and Body of this Car was designed and manufactured by the Yanase Factory.



Body Building Shop.



Paint Shop.



Repair Shop.

Automobile Assembly Plant of Takata & Company, Shibaura, Tokyo.

cars in the same price class. At the present time his company is confining its efforts to the manufacturing of aeroplane engines.

" The Tokyo Gas and Electric Co., which controlls the agencies to a number of American and European vehicles, built under government subsidy, about 100 trucks for the army. These are of two-ton capacity and appear unusually heavy, almost clumsy. An executive of the company expressed the opinion that they were too heavy and did not compare with American vehicle, and were not altogether satisfactory. This appears to be borne out by the fact that the army is now a regular purchaser of American trucks and that the Tokyo Gas and Electric Co. has discontinued truck manufacturing and is concentrating its combusition engine work to the manufacturing of aeroplane engines, it having the Japanese right for manufacturing the Gnome engine. The company has a very large plant, about six miles from Tokyo, where it manufactures gas and electrical apparatus and measuring instruments. It is not, as its name might imply, a public utility company. The major interest in the company is supposed to be held by the Matsukata family.

" The Yanase Automobile Company is one of the largest distributing companies in Japan and controls a fine line of American cars and trucks. It was supposed to be manufacturing cars at the rate of 60 per year but investigation proved that but two cars had been made and none sold. This car is known as the " Y " light car and no attempt has been made to create anything original. It is a conventional four-cylinder engine cast in one block with three point suspension, valve in head with removable cylinder head. The bore is 3-in. with a 4.25 stroke developing 14 horse-power S. A. E. rating. The thermosyphon cooling system is employed with a tubuler pointed radiator. Lubrication is affected by a constant level splash system operated by a gear pump. Other specifications are : Electric system—three unit, Delco ignation, Bijor generator and starting motor and high efficiency storage battery ; clutch, cone type, leather faced : transmission-unit with engine, selective type, sliding gear with ratios third 1:1, second 1:2.04, first 1:3.2, reverse 1: 3.88, propeller shaft, bare shaft carries universal and slip joint at each end, torque rod equipped : rear axle, three-quarter floating, reduction of drive gear 4.23, adjustable pinion gear : brakes 10-in. diameter by $1\frac{3}{4}$ with drum attached to rear wheels, hand brake is internal expanding and foot brake external contracting, front axle, cast steel integral with yoke, steering left-hand drive, half nut gear type, turning radius 17-ft. : wheels, artillery type, demountable rim : springs semi-elliptic, front $1\frac{1}{2}$-in. by 32-in., rear $1\frac{3}{4}$-in. by 42-in. These specifications are furnished by the designer.

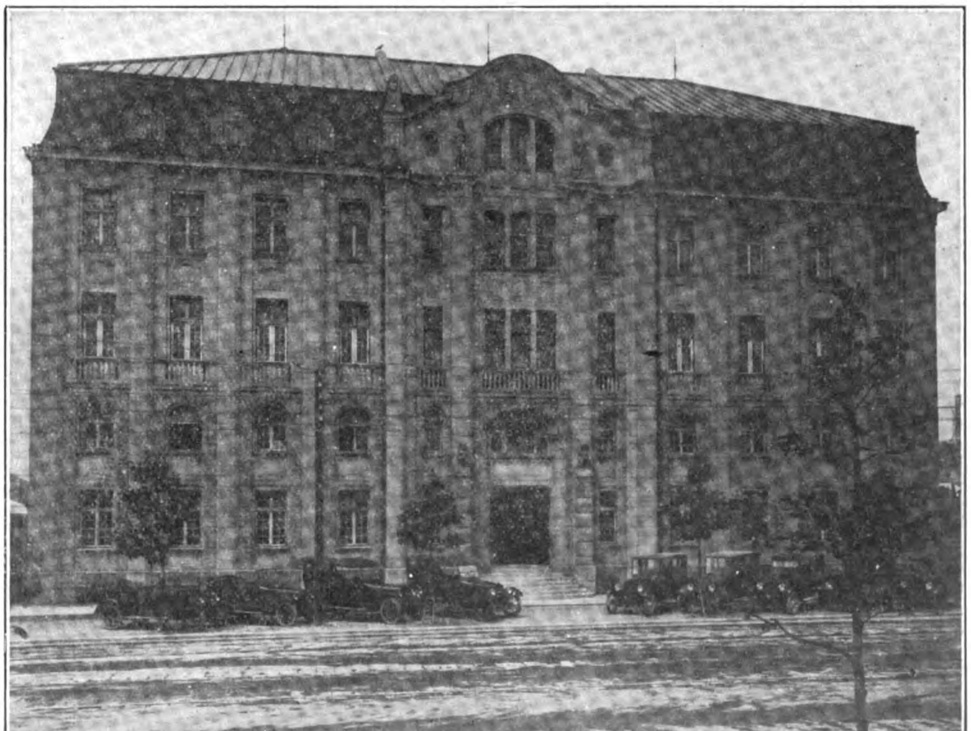
" The intention was to manufacture a car to sell for Y.3,000 (G. $1,500) but the experimental work proved that the car could not be produced to sell for less than $3,000. Mr. Yanase was very doubtful if more would be made, future production depending on the development of market conditions. The facilities of the company are not such as to lead one to believe that successful manufacturing could be carried on without the erection of a new factory, as the present plant was primarly laid out for the repairing of cars and building bodies. The efforts of the company for a long time may be discounted. It is supposed to have the support of the Mitsui family but this is an open question. The only connection discoverable is that the Yanase company is financed through the Mitsui Co.

" Trucks have been manufactured in army arsenals and, it is reported, by the Kawasaki Dockyard Co. of Kobe. At these places permission is not granted to make inspection but it is generally understood that the Kawasaki Co. is not manufacturing now, mainly for the reason that the subsidy granted by the government is not sufficient. As far as could be ascertained there is no manufacturing in Japan in order to get the benefits of the subsidy as it was found that the amount granted and the conditions under which it was granted were unsatisfactory.

" Two other companies have experimented with car assembly, but the results have never been placed on the market, and it can be assumed that aside from the efforts of the Jitsuye Hidosha Seizo Co. American manufacturers need not fear the competition of Japanese-built motor vehicles.

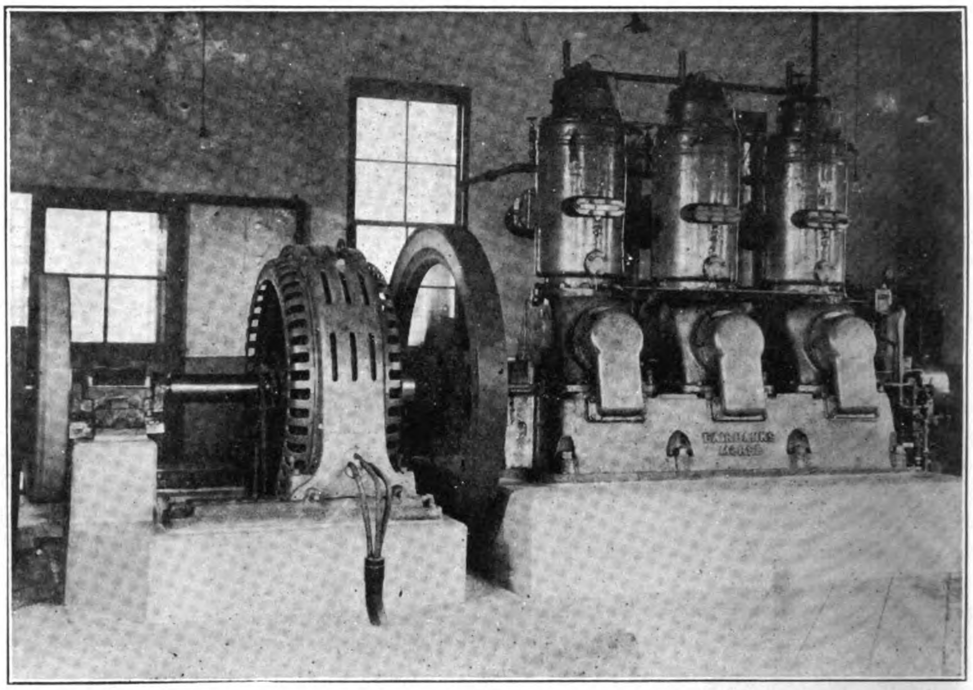
American Assembly in Japan

" At the present time but one American car is being regularly assembled at a plant in Yokohama. The cars are received in a knocked down condition with the engine and other large units already assembled. They are erected by Japanese workmen under the supervision of an American superintendent and a foreman from the American factory. Unassembled bodies are also received and



Magnificent new Office Building of Takata & Company, Tokyo, showing Cars owned by Company Officials.

these are finished at the plant. An attempt is being made to follow the progressive system of assembly by assigning workmen to perform limited operations. Conveyor belts are not being used in the plant, the cars being pushed along a raised track as is shown on page 589. From time to time the workmen are instructed on modern assembly work by motion pictures of the main plant in America. This also serves the purpose to check assumptions of complete knowledge, a tendency, which at times, was found difficult before the picture lessons were introduced. Skilled mechanics are never employed as usually they are hard to teach because of the belief that having worked in a machine shop or a garage they need no further instruction. Coolie labor is employed and with patience and a great deal of instruction the men become efficient.



The Power Plant of Sale and Frazar's Ford Assembly Plant at Negishi; 150 H.P. **Fairbanks Morse Semi-Diesel Engine and Generator.**

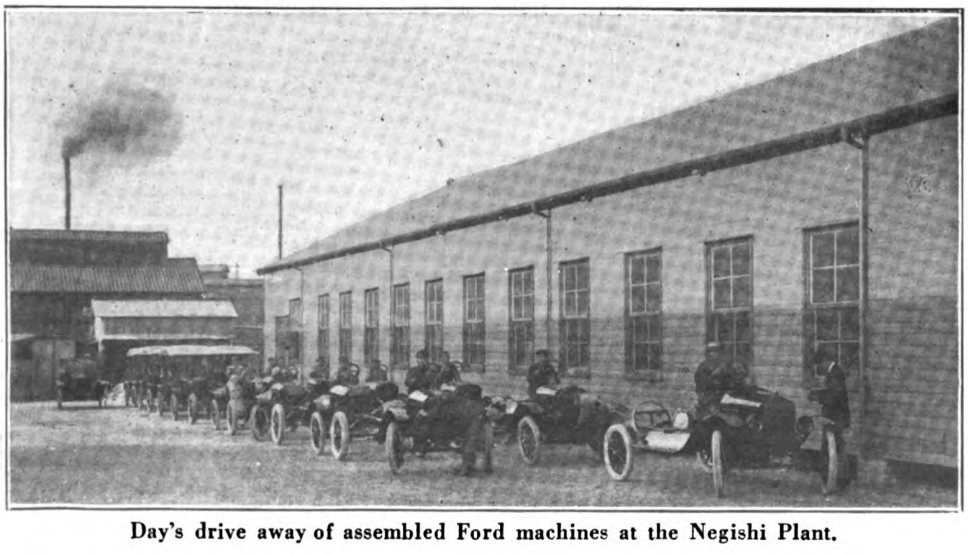
Several dealers have attempted assembly in a small way but have found that the expense of erection was greater than any saving affected. From the experience of the one successful company and those who have relinquished the idea it appears that assembly in Japan for that market alone is not justified unless at least 75 cars a month can be passed through the plant. But little can be saved on duty on each vehicle as cars partly disassembled can be imported on a basis of 25 per cent. *ad valorum.* It has been found that any possible savings which might be made by shipping quantities of each unit in single cases is more than offset by the expenditure of time and labor in the shipment. Various duties cover different parts and some of these are less than 25 per cent. but to pack and list these separately would require very elaborate billing and shipping instructions which is not justified by the saving. The distributers now assembling have looked thoroughly into the subject and have decided against it, and their experience can serve as a guide to others who might be contemplating such action. As to using Japan for the assembly of vehicles for the Far Eastern market, the writer is not prepared to say until the other markets have been surveyed. At present, however, assembly with the whole East in mind is not being done by any company, although it has been investigated by several.

Body Building in Japan

" Because of the saving which may be effected on freight, duty and interest charges on capital invested there has developed in Japan a body-building industry which is equal to meeting all the requirements of the market for car and truck bodies. But unlike the industry in America it is not specialized but has grown to its present proportions as an adjunct to the organization of the distributers. And by reason of its being a side line it imposes a burden on the parent industry which works to the disadvantage of both. Several dealers were frank enough to admit that their body-building establishments were run at a loss and agreed that cheaper and better bodies could be built by specialized shops.

The size of the shops are in proportion to the volume of the dealer's sales. The great majority of the cars and trucks imported are brought into the country without bodies, the exception generally being to meet the small demand for open cars or the cultivated taste for high-class custom bodies for high price cars, for although Japanese bodies are attractive they fall short of meeting the high standard of the custom body builders in America and Europe.

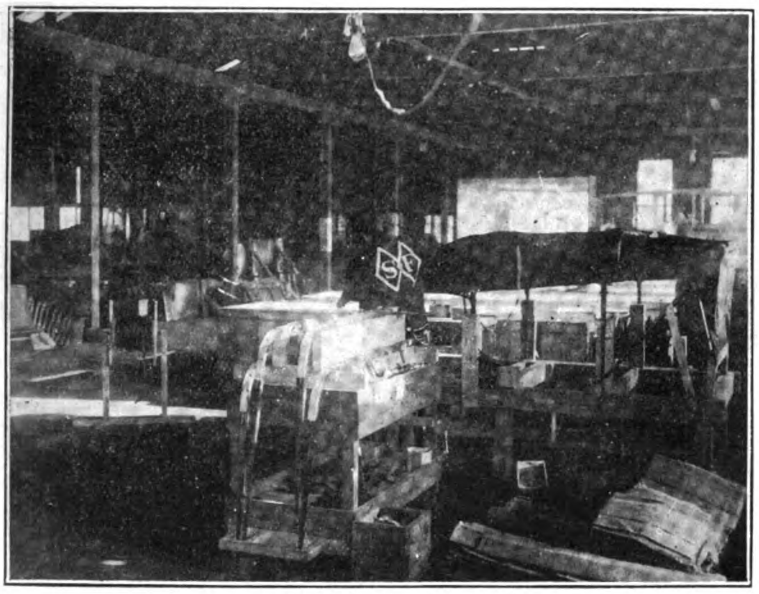
The building devoted to body building are almost without exception of wood with unpaved floors and without adequate machinery. The majority of the bodies are built of wood, although a demand is growing for metal bodies owing to the comparatively short life of wooden bodies which rarely present a good appearance after the second year due principally to warping and varnish cracks. The cause of this is the absence of kiln dried lumber, and the excessive amount of rain. It is probable that the use of metal bodies will increase, two plants now being equipped with metal working machinery. Curiously, even in the shops where modern machinery is used, laborers can be seen working with antiquated hand tools such as the adz, one way saws and scrapers.



Day's drive away of assembled Ford machines at the Negishi Plant.

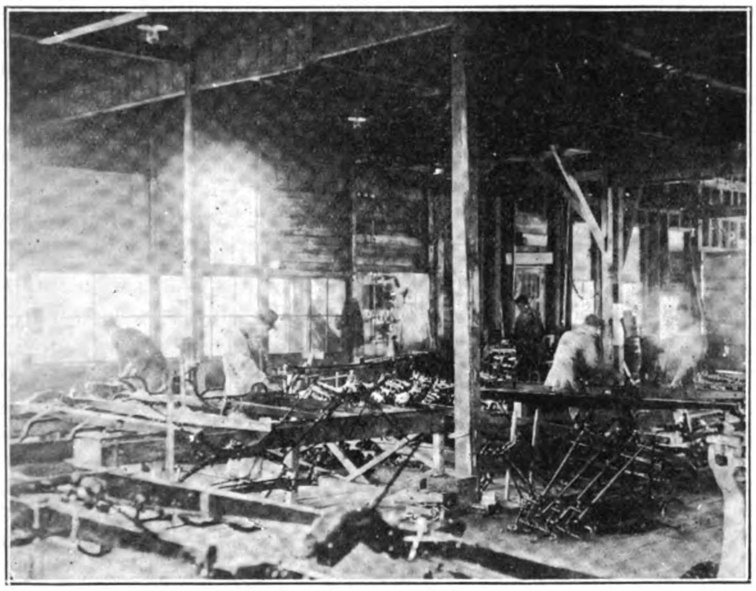
A fairly hard wood is used which lends itself readily to being worked to a smooth finish. Practically all bodies made in Japan are of the limousine type built to accommodate five people inside. The interiors are well finished and compare favorably with the average American job of the same type. Bedford cord is used in upholstering and there are the usual accessories to comfort such as speaking tube, arm rests, flower holder, ash receiver and

SALE AND FRAZAR'S FORD ASSEMBLY PLANT AT NEGISHI, YOKOHAMA

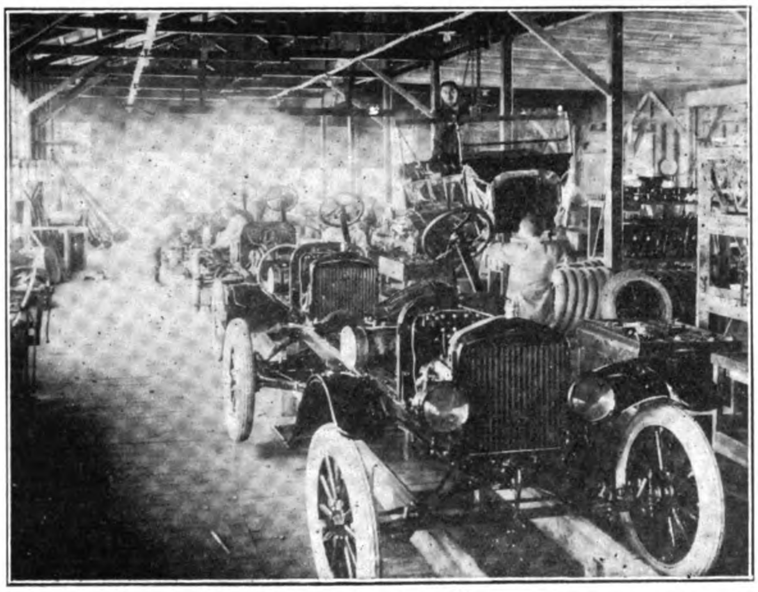


Top and Wind Shield Assembly.

Paint Shop.

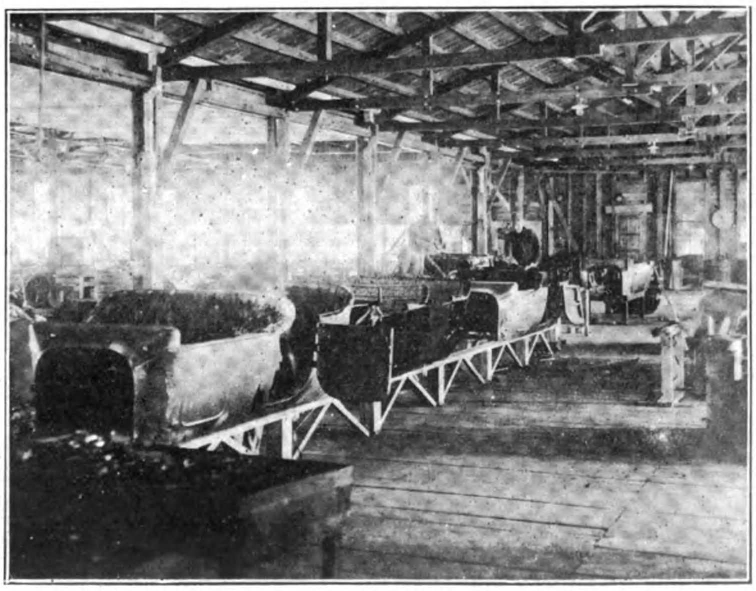


Rear Axle Assembly.

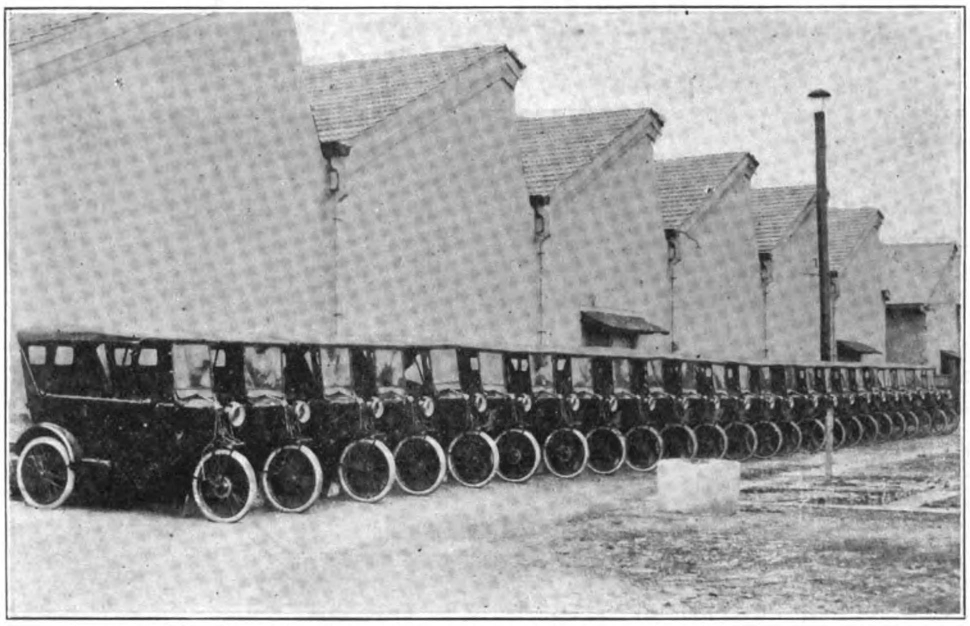


Progressive Assembly.

Battery Charging Room.



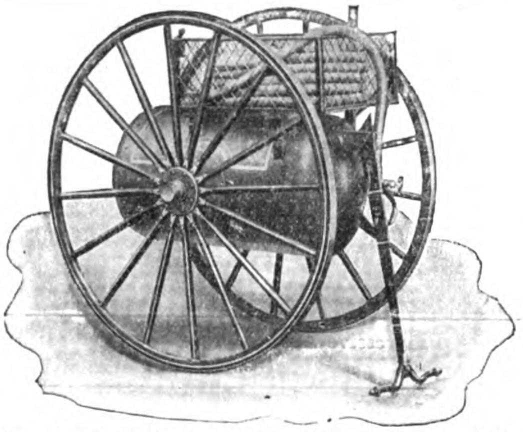
Body Assembly.



Jitsuyo Automobiles Ready for Shipment outside the works of the Jitsuyo Jidosha Seizo Company at Osaka.

silk curtains to match the upholstery. The bodies are finished with Japanese lacquer. From six to twenty-four coats are applied, and prices range from $750 to 1,500. The average price is about $1,000 for a body comparable to what is generally furnished on a medium price American car. Truck bodies to meet special requirements can and are occasionally built but as a rule, standard platform and stake bodies are supplied which cost approximately $300.00. A standard buss body with aisle seats to accommodate 12 passengers is furnished for $1,000. The bodies of busses are usually crudely finished.

There is unquestionably an opportunity for the organization of an efficiently equipped and managed body-building plant and it would be to the best interests of the dealers to turn their work over to it for under the present practice of separate body-building plants an unnecessary amount of capital is required to conduct a motor distributing agency thereby limiting not only the operations of present dealers but serving to check new capital."



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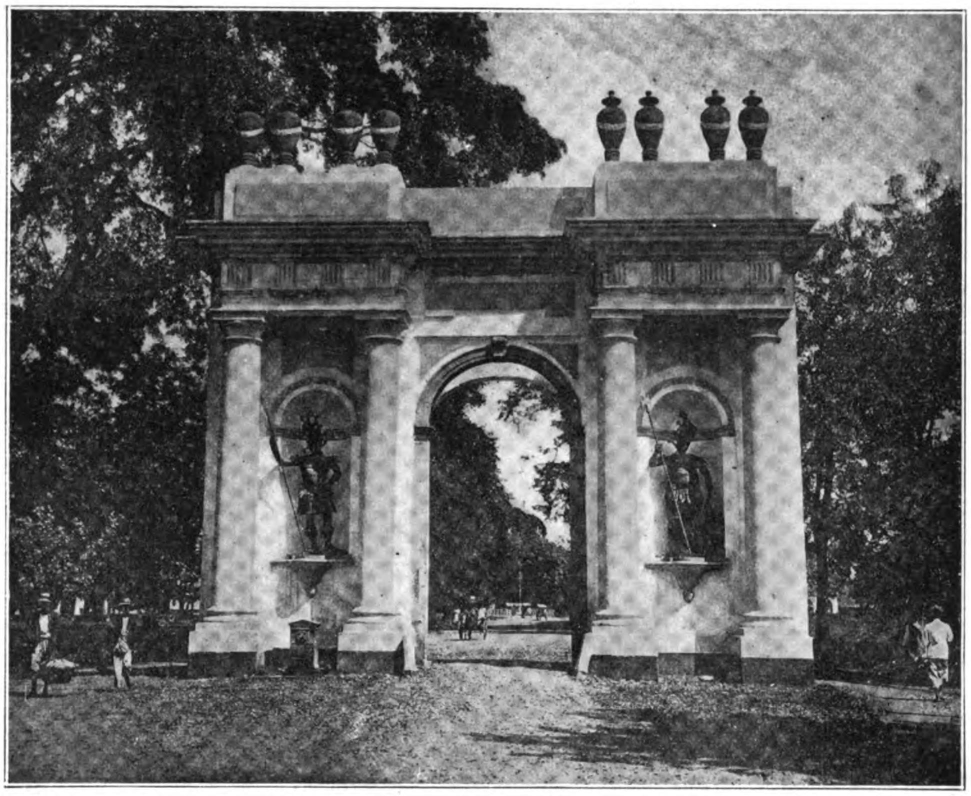
Motors and Roads in the N. E. I.

Working Results of the State Railway Motor Services

By L. C. Blochman

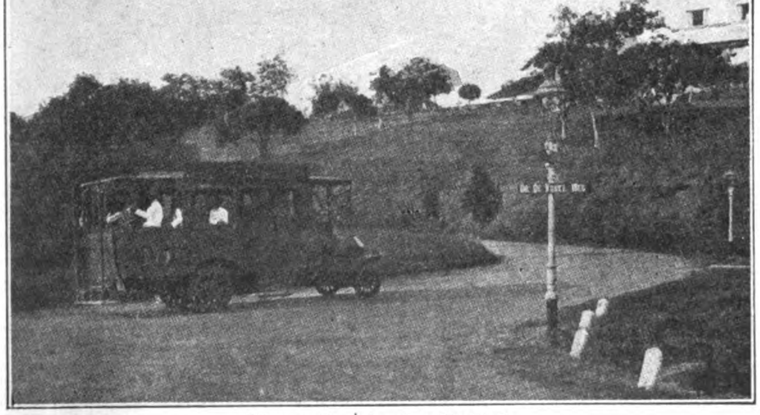
THE general state of a country's business can generally be judged by the state of the second-hand car market. The depression caused in Java by the fall in rubber, sugar and coffee is plainly reflected in the number of used automobiles which can be bought for ridiculous prices to-day. Some dealers, caught with large stocks of new cars, are putting their surplus stock into taxi service. Several new "for hire" establishments have sprung up in Batavia, Semarang and Sourabaya since the demand for motor cars has dropped off.



Penang Gate in Batavia (Lower Town)

Java dealers look for a revival of the automobile business at the first signs of better general conditions. There are already 18,700 cars registered in Java, 85 per cent. of which are of American make. Medium-priced cars are in great predominance, most of the American quoto being drawn from the Ford, Dodge, Buick, Chevrolet, Oakland, Hudson and Essex. Among the European machines, the Fiat leads the list, with the Citroen, Wolseley and Minerva in close competition. The Swiss Pic-Pic, the Mercedes and the Austrian Daimler are also finding some sale.

German competition is difficult to meet in price, but shipments cannot be guaranteed on account of the enormous demand for the cheaper cars. Prices also fluctuate with the varied career of the mark, and only Java firms with buyers in Europe can purchase German cars at a price which is not liable to change between mails. No European cars are able to compete with American makes in hill climbing. Inasmuch as most of the roads in Java are through mountainous regions, the superior power on an incline gives U.S. cars a big advantage. The prevalance of hills, together with the high cost of fuel, makes a light car the only kind that has a universal sale in the island.



Motor Bus in the N. E. I.

Java boasts 10,000 miles of motor roads, in good condition and all posted after the French system by the Java Motor Club. The general road plan, the system under government supervision, includes two roads across the island from east to west along the north and south coasts, and five cross roads. As originally planned, the completed system was to cost 5,000,000 guilders, but increased costs in both labor and material have boosted the estimate to 8,533,000 guilders. At the end of 1921, 4,077,000 had already been expended. The provincial plan, which is being carried out by the individual provinces in connection with the general plan, was to have been completed in ten years at a cost of 24,000,000 guilders. A new estimate will place the final expenditure nearer to 40,000,000.

A glance at the table found at the end of this article shows that Java received less than 20 per cent. of the 1921 appropriation for the construction and repair of roads and bridges throughout the Dutch East Indies. As a matter of fact, efforts to develop the outlying possessions have called for great expenditure on highways. In many places, the Java state railways have established auto services to reach territory not served by rail connections. This is particularly true in Sumatra, which has received the lion's share of the appropriation for the outlying islands.

At the end of 1918 there were nine roads completed and 17 building, with an expenditure of 15,630,000 guilders. At the end of 1921, 12 roads had been finished, 18 were still in the process of construction, and the total expenditure had reached approximately 19,000,000 guilders.

The following figures show the expenditure (in guilders) on roads and bridges in the Dutch East Indies for the past six years :—

	Expended for the Construction and Renewal of Roads and Bridges (Guilders)		
	Java	Outlying Possessions	Total.
1916	1,402,234	3,542,962	4,945,196
1917	1,938,014	3,843,346	5,781,360
1918	1,738,587	3,889,580	5,628,167
1919	1,820,772	4,636,063	6,456,835
1920	1,402,659	6,014,803	7,417,462
1921	1,264,037	6,849,599	8,113,636

State Railway Motor Services

Foremost in the development of motor transportation in the Netherlands East Indies is the road motor department of the state railways which is constantly extending its services into districts which the railway cannot reach. At present, road construction with its attendant motor bus service is being pushed more intensively in Sumatra than elsewhere in the N.E.I. The general road program for that island embraces the construction of 54 roads with a total length of 4,600 kilometres estimated to cost Guilders 63,000,000. The object of this system is to give access to and open up the remarkably rich agricultural and timber lands in the interior. Wherever practicable the roads are being supplemented by motor boat navigation on the rivers and lakes.

By the end of 1921 the states railways were operating five district motor services in various parts of the archipelago, with a total of 3,100,000 car kilometres run during the year, of which, 1,920,727 car kilometres were run by goods trucks and 1,179,605 kilometres for passenger traffic. The working results of these various motor service divisions for 1921 are as follows:

1. SUMATRA'S WEST COAST AND TAPANOELI SERVICE

Manager's Residence, Fort de Kock:

No. of kilometres run by goods motors 446,962

No. of kilometres run by passenger motors 440,278

Receipts: 1920, F. 552,813; 1921, Fl. 637,506.

Expenditures: General charges, Fl. 38,333; Traffic expenses, 70,060; Running expenses, 46,664; Maintenance and repairs, 74,044; Other working expenses, 192,338; Renewals, 1,689; Total, Fl. 423,128. In 1920, 383,228.

Capital Account:

Balance from 1920 ..	Fl. 395,038.30
Additions in 1921 ..	128,410.05
	523,448.35
Depreciation in 1921..	83,616.78
Balance, Dec. 31, 1921..	439,831.57

Provisional Balance Sheet, 1921:

Income: Passengers, Fl. 404,969.62; Goods, 138,274.35; Miscellaneous, 9,569.05; Value of stock, December 31, 1921, Fl. 144,414.12; Total, Fl. 697,727.14.

Expenditure: General charges, Fl. 81,757.26; Traffic expenses, 70,060.46; Running expenses, 300,435.69; Value of stock, January 1, 1921, 108,177; Balance, 137,296.77; Total, 697,727.14.

Net Revenue Account: Interest on capital expenditure, Fl. 22,962.17; Depreciation, 60,-616.78; Net profit, 53,716.82; Total, 137,296.77.

During September this service was extended beyond Sipirok (in Tapanoeli) as far as Sipogoe. During the rainy season the service was greatly handicapped by landslips on the mountain roads, while the service to Pematang Siantar could not be started because the metalling of the road had not been completed.

2. BENKOELEN MOTOR SERVICE

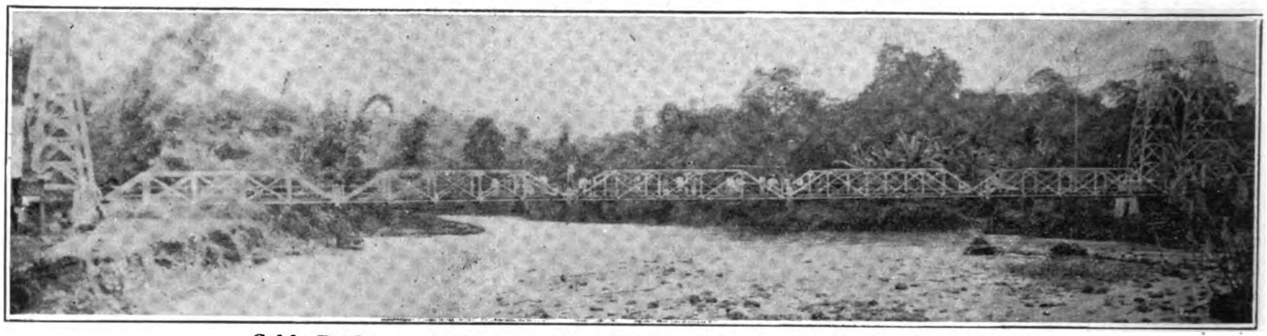
Manager's Residence, Benkoelen:

No. of kilometres run by goods motors 571,121

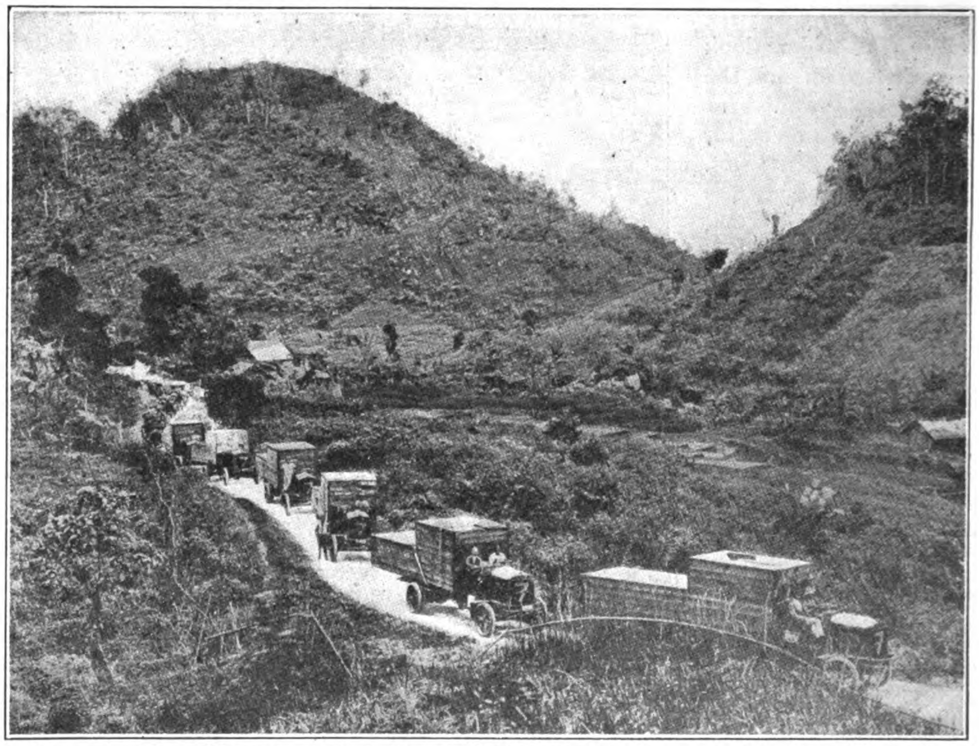
No. of Kilometres run by passenger motors .. 347,428

Receipts: 1920, Fl. 600,810; 1921, 469,810.

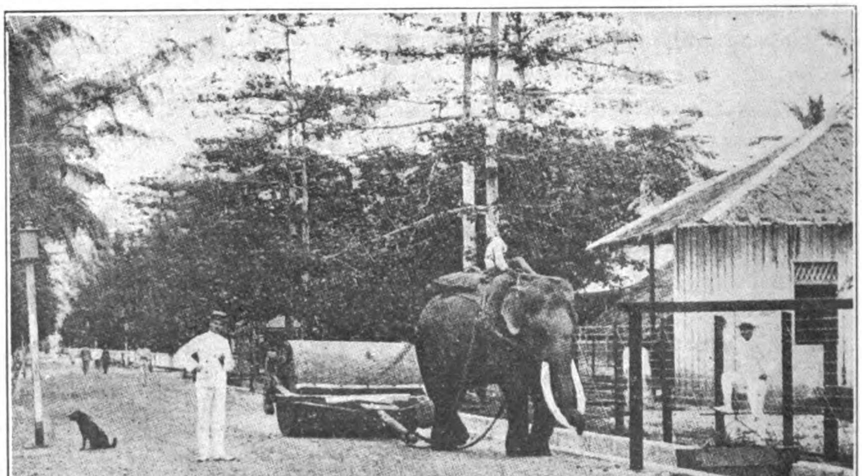
Expenditures: 1921, General charges, Fl. 42,212; Traffic expenses, 70,826; Running, 60,890; Maintenance and repairs, 161,888; Other working expenses, 175,969; Renewals, 4,930; Total, 516,715. In 1920, 565,015.



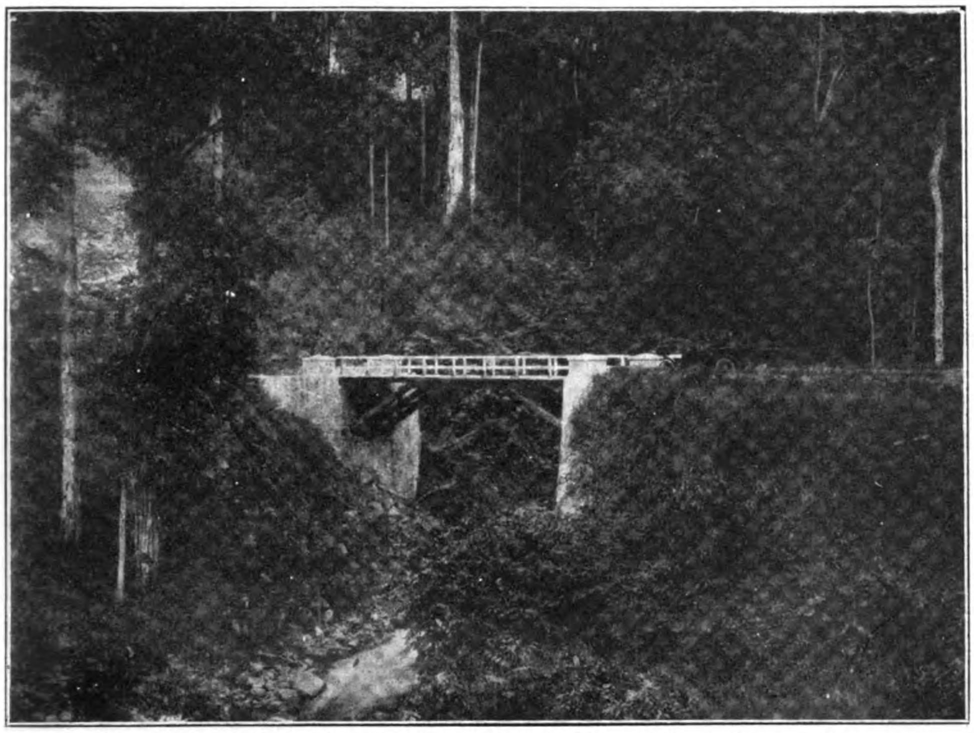
Cable Bridge on the Tjoeroen-Moera Aman Highway, Benkoelen Province



Seventeen Fageol Trucks on their Way to Delivery to the Government in Java—Each of the Trucks Carries Another in a Crate



A Road Roller at Work in Pangkalan Brandan, Sumatra



Bridge on the Main Road to the Gajoe District of Atchin, North Coast of Sumatra

Capital Account :	Balance from 1920 ..	..	Fl.491,689.89
	Additions in 1921 ..	..	43,088
			534,777.89
	Depreciation, 1921 ..	..	130,862.03
	Balance, December 31, 1921		403,915.86

Provisional Balance Sheet, 1921 :

Income: Passengers, 233,510; Goods, 230,430; Others, 5,120; Value of stock, December 31, 1921, 184,820.86; Balance, 65,953.68; Total, 719,834.54.

Expenditure: General charges, 84,986.13; Traffic expenses, 70,826.46; Running, 396,390.95; Value of stock, January 1, 1921, 167,631; Total, 719,834.54.

Net Revenue Account : Balance from income and expenditure account, 65,953.68; Interest on capital exp., 25,661.70; Depreciation, 70,612.03.

Net Loss : Fl. 162,227.41.

This service experienced a strike of drivers and garage men because of strict supervision, but was kept open by the European staff. The service was extended during February beyond Moera-enim as far as Tambang Sawah, government gold fields.

3. Palembang Motor Service

Manager's Residence Morea-enim :

No. of kilometres run by goods motors	Fl.545,918
No. of kilometres run by passenger motors	268,272

Receipts : 1920, Fl. 663,998; 1921, 584,486.

Capital Account :	Balance from 1920 ..	..	Fl.384,421.31
	Additions, 1922 ..	..	14,741.33
			399,162.64
	Depreciation, 1921 ..	..	105,038.02
	Balance, December 31, 1921		294,124.62

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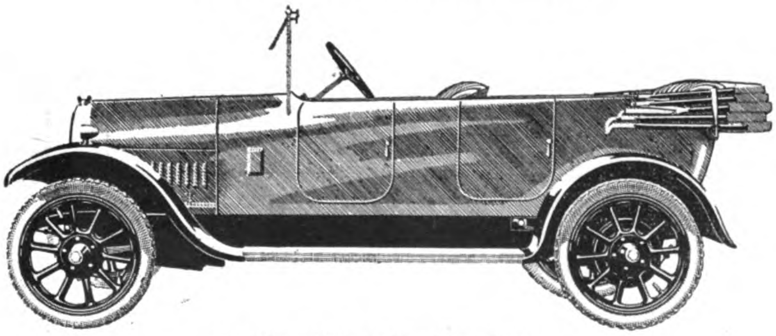


11.4 h.p. All-weather Four-Seater

Provisional Balance Sheet, 1921 :

Income : Passengers, 316,826.58 ; Goods, 250,515.54 ; Others, 17,143.48 ; Value of stock, December 31, 1921, 298,384.73 ; Balance, 45,277-.98 ; Total, 928,148.31.

Expenditures : General charges, 111,448.56 ; Traffic, 80,662.08 ; Running, 490,952.67 ; Value of stock, January 1, 1921, 245,085 ; Total, 928,148.31.

Net Revenue Account : Balance from income and expenditure account, 45,277.98 ; Interest on capital, 19,589.61 ; Depreciation, 67,228.02 ; Net loss, 132,095.61.

CENTRAL PREANGER MOTOR SERVICE

Manager's Residence, Tjimahi :

No. of kilometres run by goods motors	Fl.112,239
No. of kilometres run by passenger motors	50,286

Receipts, 1920, 74,226 ; 1921, 118,357.

Expenditures : General charges, 5,945 ; Traffic, 12,799 ; Running, 11,242 ; Maintenance and repairs, 16,599 ; Others, 46,324 ; Total, 92,-909 ; In 1920, 77,901.

Capital Account :	Balance from 1920	Fl. 127,640.66
	Additions in 1921	99,530.45
		227,171.11
	Depreciation, 1921	17,031.56
	Bal., Dec. 31, 1921	210,139.55

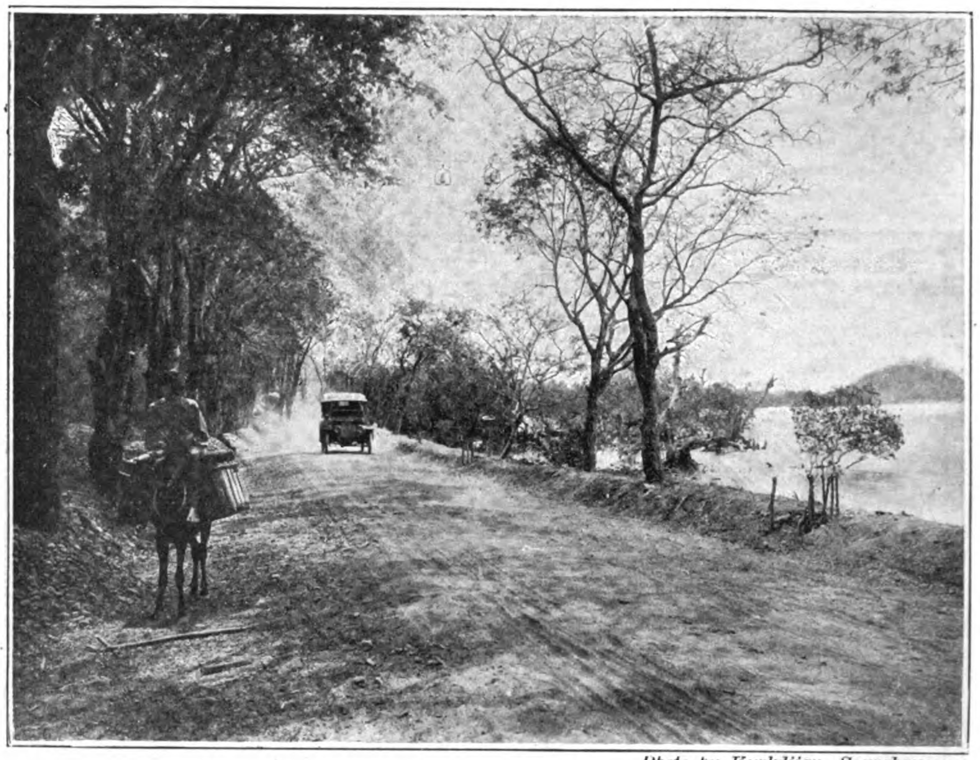


Photo by Kurkdjian, Sourabaya

Motor road along the North Coast of Java. Notice the way in which telegraph poles are made unnecessary

Provisional Balance Sheet, 1921 :

Income : Passengers, 64,910.00 ; Goods, 52,215.50 ; Others, 1,231.50 ; Value of stock, December 31, 1921, 10,832.11.

Expenditures : General charges, 28,678.60 ; Traffic, 12,798.95 ; Running, 59,207.05 ; Value of stock, January 1, 1921, 19,118 ; Balance, 9,386.51.

Net Revenue Account : Interest on capital, 8,870.29 ; Depreciation, 17,031.56 ; Balance from income and exp. account, 16,515.34 ; Net loss, 16,515.34.

CHERIBON MOTOR SERVICE

Manager's Residence, Koeningan :

No. of kilometres run by goods motors . ..	Fl.224.487
No. of kilometres run by passenger motors ..	73,341

Receipts : 1920, Fl. 102,561 ; 1921, 124,115.

Expenditures : General charges, 7,797 ; Traffic, 15,566 ; Running, 17,676 ; Maintenance and repairs, 30,505 ; Others, 70,027 ; Renewals, 508 ; Total, 142,079 ; Loss, 17,964.

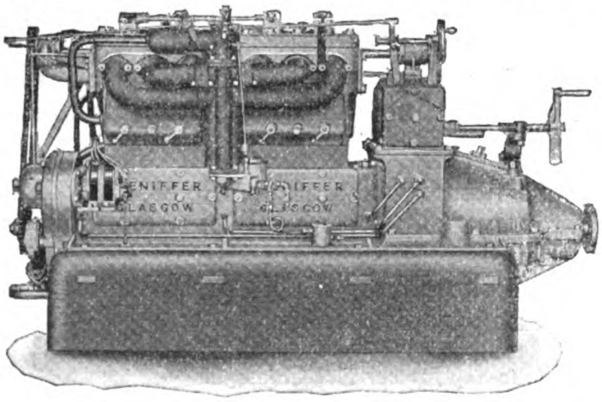
This loss is attributed to the competition with several private services operating on the Cheribon-Koeningan run.

Capital Account :

Balance from 1920	Fl. 159,422.94
Additions in 1921	5,644.07
	165,067.01
Depreciation, 1921	34,822.62
Balance, Dec. 31, 1921 ..	130,244.39

GLENIFFER

KEROSENE & PETROL MARINE MOTORS



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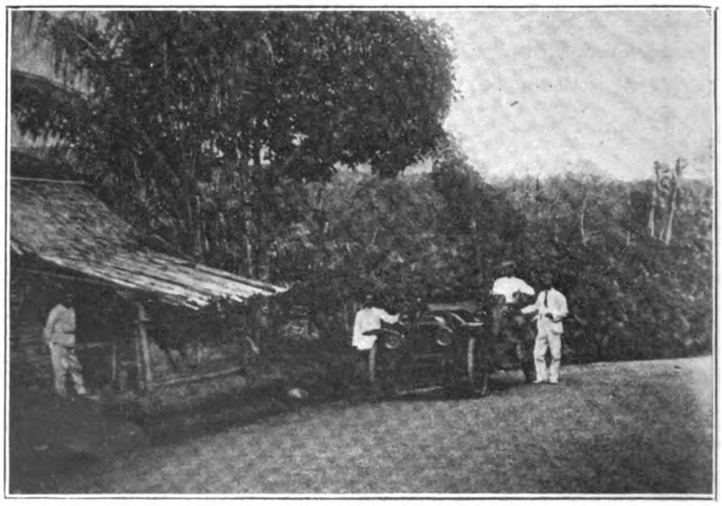


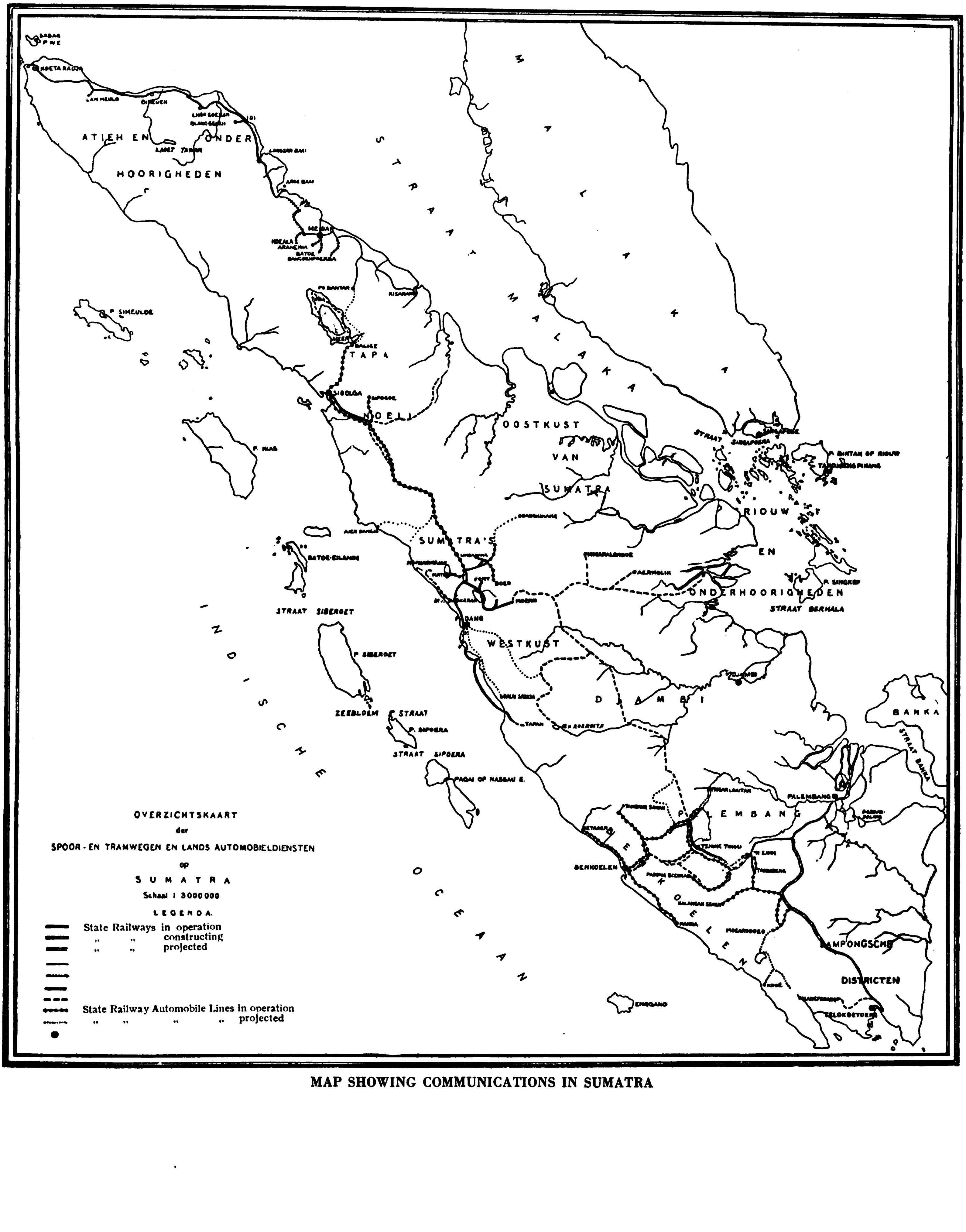
A Road in Menado, Celebes

Provisional Balance Sheet, 1921 :

Income : Passengers, 114,093.15 ; Goods, 9,015.50 ; Others, 1,006.25 ; Value of stock, December 31, 1921, 33,611.96 ; Balance, 45,013.55 ; Total, 202,740.41.

Expenditures : General charges, 33,062.80 ; Traffic, 15,566.08 ; Running, 104,576.53 ; Value of stock, January 1, 1921, 49,535 ; Total, 202,740.41.

Net Revenue Account : Balance from income and exp. account, 45,013.55 ; Interest on capital, 8,112.25 ; Depreciation, 34,822.62 ; Net loss, 87,948.42.



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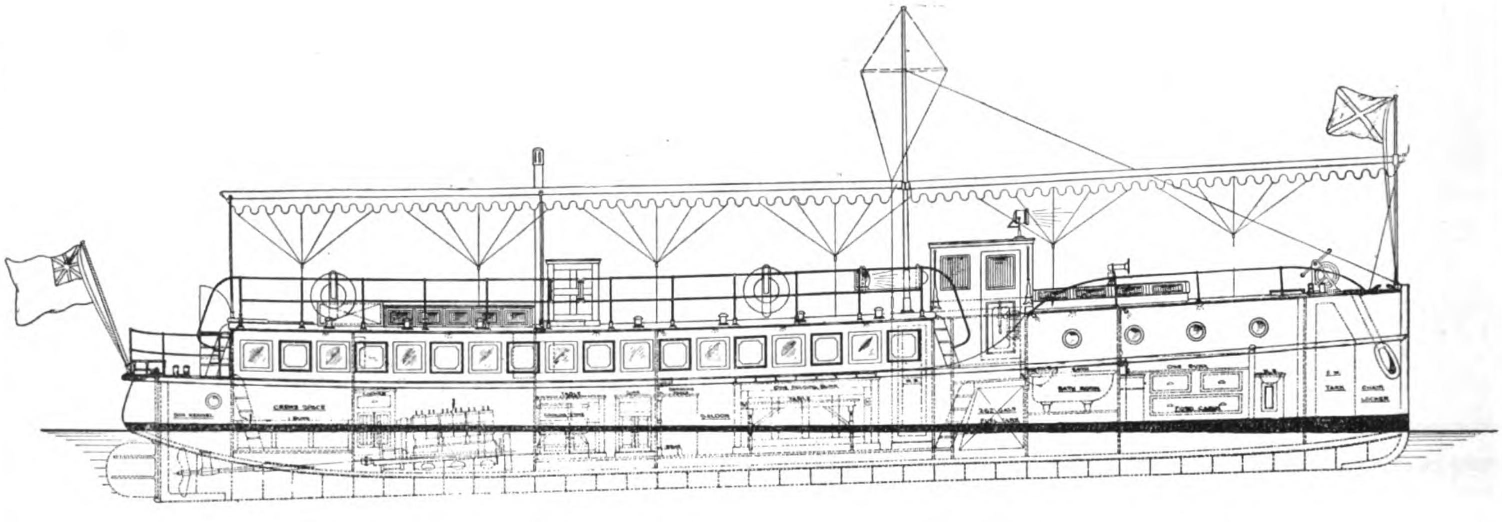

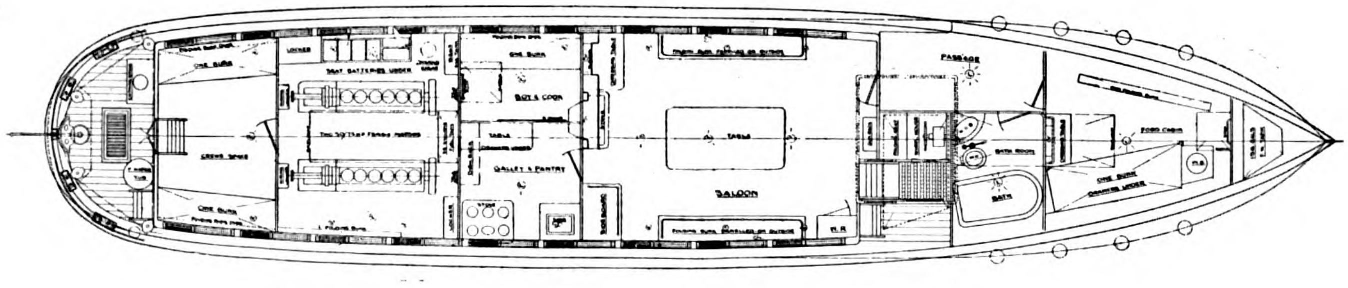

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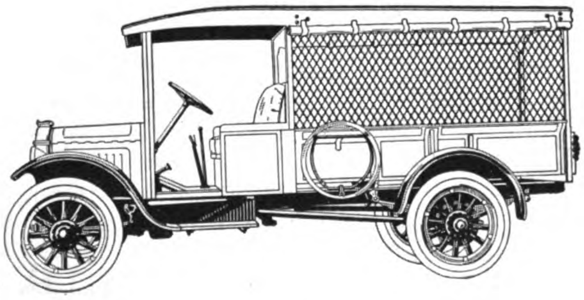

The Republic Light Delivery Van supplies the long felt want for a reliable, speedy means of delivering merchandise over a wide district.

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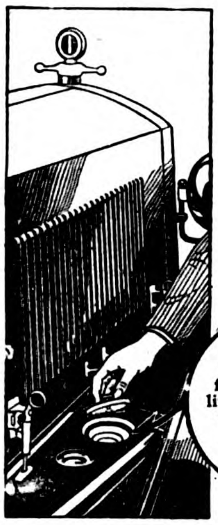
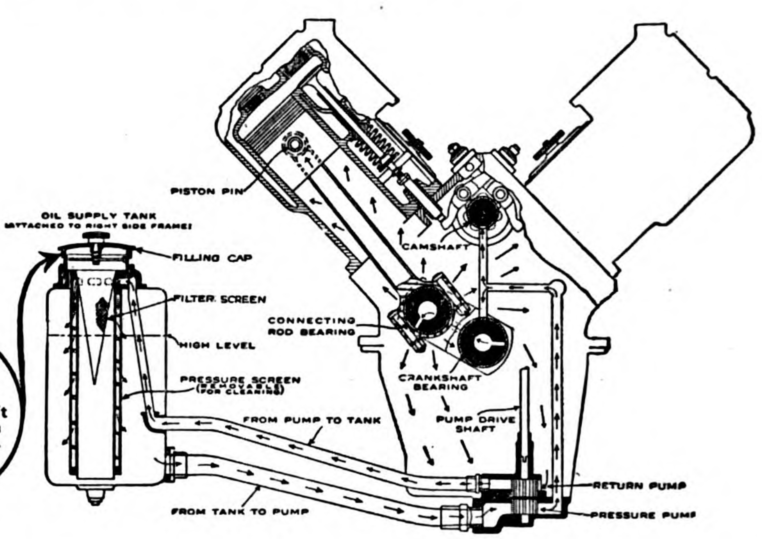
AIRPLANE LUBRICATION FOR AUTOS

MUCH interest has been evidenced in motor car circles and among car owners in the new airplane system of motor lubrication. It has proved amazingly efficient, the average mileage yield per quart of oil being well above 500 miles. It also has borne out the claims of its sponsors that it greatly reduces wear and tear on moving parts, thereby adding materially to the life of the motor.



Oil tank apart from crank case, filled without lifting hood. Left view shows position of filler cap and gauge.



Engineers of The Standard Motor Car Company, Pittsburgh, are the first to apply the airplane system to the automobile. On the Standard Eight the oil is carried apart from the crank-case in a three-gallon container anchored to the frame under the right front fender. Oil flows by gravity through a flexible tube to the crankcase, whence it is pumped upward to cylinders, bearings, rods and all other moving parts.

It then drops to the base of the engine and is pumped back into the container, being cooled and re-filtered before again making its circuit through the motor. On a recent test run from Pittsburgh to New York, less than a quart of oil was consumed. Temperature readings after climbing and descending the redoubtable Tuscarora Ridge of the Alleghany mountains showed no appreciable increase in oil heat.

This system is based on that developed during the war by allied engineers who produced it to increase the efficiency of battle planes. In the early stages of the war countless plane bearings burned out, for in a quick descent rear bearings were starved, while forward ones were flooded. On a steep climb front bearings were almost unlubricated while rear ones were inundated. Spark plugs fouled. Carbon deposits were heavy.

By carrying the oil in a separate container and forcing it to all moving parts, regardless of the pitch of flying, these evils were overcome. In the automobile it is almost as important an improvement as in the airplane. In steep climbs or quick descents oil is pumped uniformly to all parts. There can be no starved bearings nor flooded ones, nor fouled spark plugs.

It is believed that airplane lubrication of the motor car is among the most notable of automobile achievements in recent years. It has proved equally efficient in summer and zero temperature.

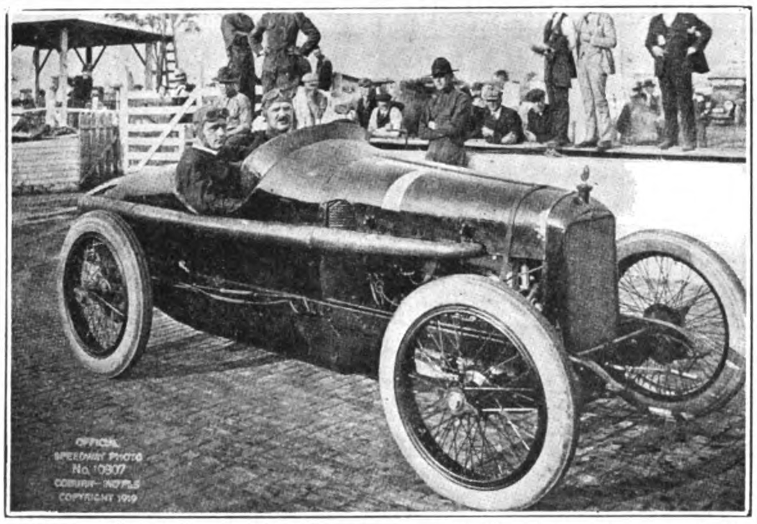
Graphite Transmission and Differential Grease No. 677

We are proud to state that No. 677 has justified the labor and expense devoted to a really intelligent effort to produce an ideal gear lubricant. It has successfully stood the test of years. There is nothing like it on the market. It is the grease the "Speed Kings" use.

No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



"Many times Dixon's Graphite Automobile Lubricants have pulled my car through a trying race without lubricating difficulty."—LOUIS CHEVROLET.

Joseph Dixon Crucible Co.

Established, 1827

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22 KIUKIANG ROAD

SHANGHAI, CHINA

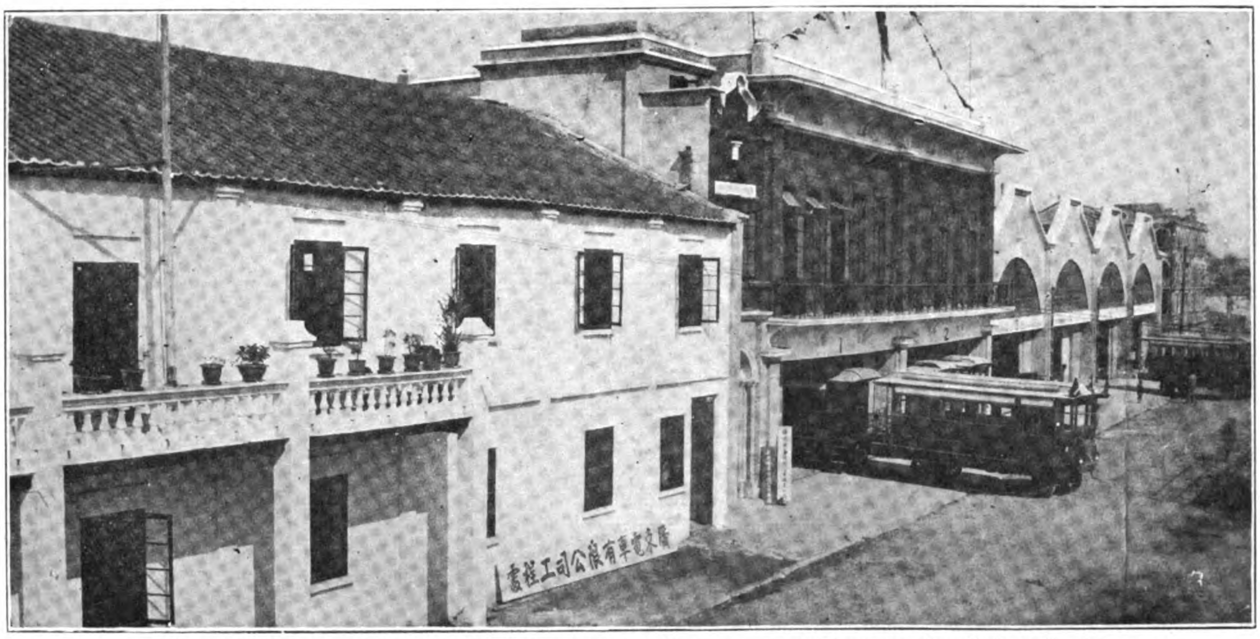
Graphite Cup Greases

Cup Greases containing fine flake graphite reduce friction to a minimum. By using these high-grade graphited greases, bearings soon acquire the well-known graphite polish that eliminates friction and causes easy running. Used in all grease cups, wheel spindles, etc.

Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

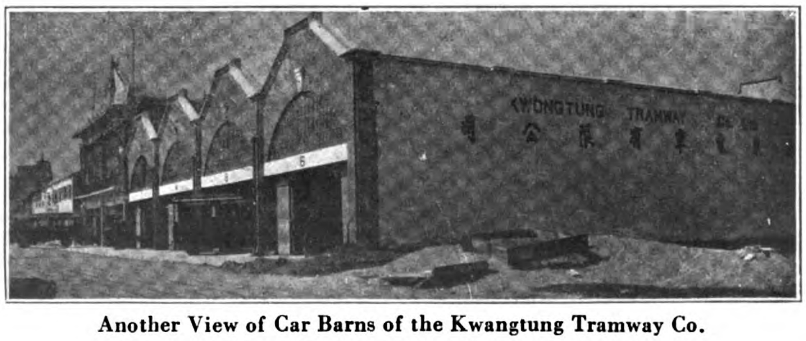
Sold in one, five and ten pound tins. Larger packages if desired.



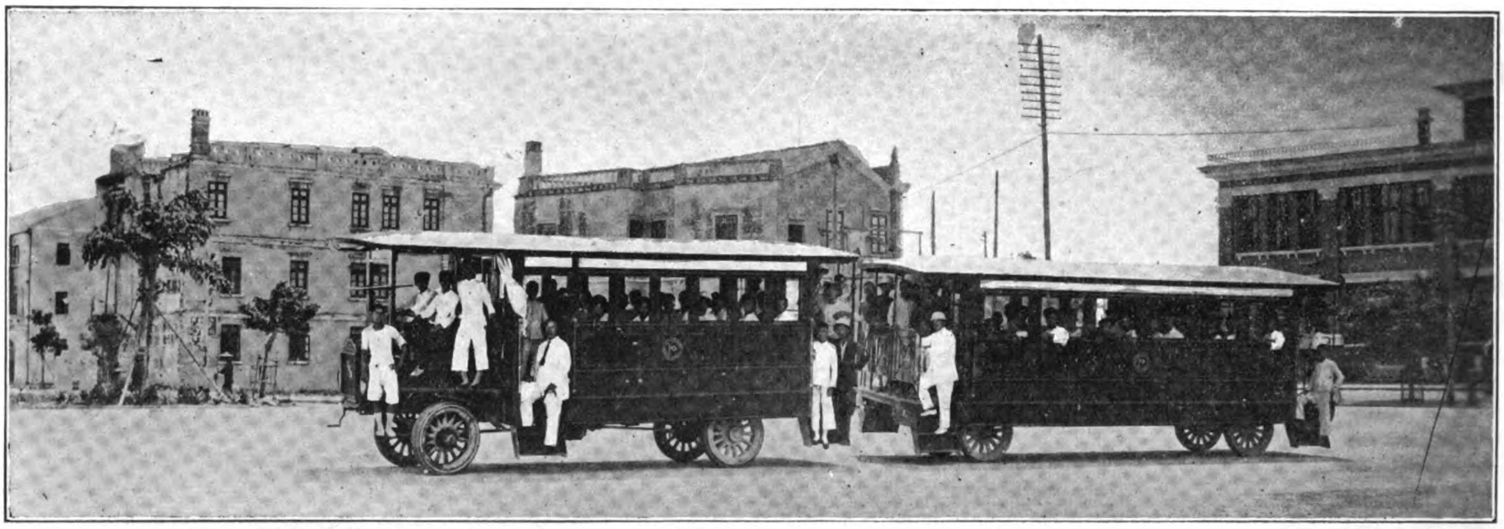
Offices, Car Barns and Engineering Department of the Kwangtung Tramway Co., Ltd. at Canton

The Kwangtung Tramway Co., Ltd.

EARLY in 1917, a Canadian promoter, T. R. E. MacInnes, appeared in Canton, and, obtaining an interview with the Governor, Chu Ching-lan, proposed to take down the ancient walls of the city, and cut a number of boulevards through the narrow streets, for the purpose of operating a tramway service. He was well entertained by the governor, who regarded the proposition very favorably. Mr. MacInnes was fortunate in associating with himself Mr. Peter Hing (Wu Tsic-pun) a clever and resourceful Chinese lawyer, trained in Canada, and the first Chinese graduate of McGill University. Political disturbances in Canton in 1917 prevented the scheme being carried out at the time. But two years later MacInnes returned to Canton, and continued his interrupted negotiations. In August, 1919, a concession was granted to him and his two associates, Messrs. Peter Hing and Sam Kee (Chan Choi) a well-known Chinese merchant of Vancouver, and naturalized Canadian citizen. By the concession an exclusive franchise was granted for a term of twenty years to operate any form of tramway service in Canton and suburbs anywhere within a radius of ten miles from the centre of the city. Forthwith a company was incorporated under name of the Kwangtung Tramway Company, and the concession was assigned to the company. Like the Wing On Company, the Sincere Company, the Sun Company, and other well-known Chinese mercantile organizations, the tramway company was incorporated under the laws of Hongkong as a Hongkong-China company, thereby having its affairs administered under wise regulations, and the interests of its shareholders properly protected. The company paid one million dollars Hongkong currency to the Canton government for the concession, and for that the company is free from taxation in any form, direct or indirect, during the term of the concession, or any renewal of it. The million dollars so paid was entirely expended in taking down the walls of the city, and constructing boulevards, or maloos, as they are locally known, developing a plan originally prepared by a Canadian engineer, P. W. W. Bell, who came to Canton at the suggestion of MacInnes in 1917. The company, in spite of many unusual difficulties, and civil strife in Canton, has forged ahead to success under the strong and experienced direction of Mr. Eng Hok-fong, a Chinese business man of Hongkong, who became president and managing director of the company. Mr. Eng Hok-fong is president also of the Mexico Steamship Company and the Eng Hok Fong Steamship Company, and has been a man of affairs in Mexico and California as well as China. With him, as directors of the tramway company, are associated Messrs. Ng Ye-hon, Yu Tao-sang, Chin Kwang-hing, Kwong Cheung-pao and Chung Tin-yow, all wealthy business men of Hongkong, and Messrs. Ma Chao-kum, Lau Siu-wan and Ng Cheu-kwan of Canton, and T. R. E. MacInnes of Vancouver. Mr. MacInnes is the only foreign member of the company, and he is temporarily residing in Canton to give what assistance he can to the company during present disturbed conditions. Mr. Peter Hing is the energetic local manager, and is ably assisted by Messrs. Fong Ukiah as sub-manager and Ng Lai-ting, traffic manager. The company in 1920 decided to operate motorbusses, after the fashion of London, and for that purpose purchased a number of F. W. D. trucks in the United States, building the bodies in Canton. At present, on the maloos which have been completed, the company operates twenty cars with fifteen trailers. The cars seat twenty-three first-class passengers, and the trailers forty-three second class. The company laid down several miles of specially concreted strips along the maloos on which to run its cars. It has been found, however, that the foundation is not sufficient, and the roads are in continual need of repair. So the company has now decided to lay down ten miles of double track grooved rails and run its motor cars thereon as is now economically done in the United States for short routes, and on over four hundred miles of the P. G. E. Government Railway of British Columbia. The first rails laid



Another View of Car Barns of the Kwangtung Tramway Co.



One of the F.D.W. Trucks and Trailers in use by the Kwangtung Tramway Company, starting out from the Tashatao Railway Station Terminus in Canton on the 150-foot wide Pak Wan Maloo (White Cloud Highway). These are three-ton trucks with power and brakes applied to all four wheels. This is claimed to add greatly to safety in handling, a most important feature when inaugurating a new service in a Chinese city where the prevailing sentiment is apt to be against any innovation in the old modes of transportation.

The F.W.D. trucks are designed so they can be converted into rail-cars by simply replacing the rubber tires with steel ones and locking the steering gear. As soon as the present trouble is over, the company intends to lay down steel tracks and when this is done it will only take a couple of hours work on each car and trailer to convert them for the rails. The work is under the direction of an experienced American engineer, Mr. Harvey L. Decker, who has had considerable experience in working these cars in India.

down will be from the Canton-Kowloon Railway Station (Tashatao) to the Canton-Hankow station (Yueh Han) a distance of four miles through the busiest section of the city. For this purpose the houses along Shakee, opposite the foreign island settlement of Shameen, were being demolished with the object of widening the fifteen-foot thoroughfare to a maloo of eighty feet when the conflict between Sun Yat-sen and Chen Chuing-ming put a temporary stop to the work. This disturbance, however, is looked upon by the company as no more than a passing storm, and it is confidently expected that the normal life of the city will be resumed before the summer is over. During the bombardment of Canton on the 17th of June last the company's buildings were struck by five shot, but fortunately they were solid shot and not shell, so not much damage was done, and none of the company's employees were hit, although at a teahouse within a hundred yards sixteen people were killed and many injured, and several were killed on adjacent streets. One shot coming through the wall crossed directly over the desk where Mr. MacInnes usually sits, but he had his head elsewhere at the time, else it would not be where it now is. Except when stopped by definite military orders the company continues to run its cars during the present trouble, even when the shops are all locked and barred. To see them going gives a certain amount of confidence to the citizens, and it helps to allay panic. The period of twenty years for which the concession was granted does not begin to run against the company until a certain minimum route of maloos has been completed by the city, and therefore the present time is so much added during which the company organizes its business and trains a loyal body of employees. The company has been fortunate in securing the services of Mr. Harvey Decker, an American motor expert, who has had wide experience in handling motor-trucks in tropical countries, including India and Java. Rails will be laid down of proper weight and fashion so that if in the future it be thought more profitable to build a power-plant and run electric cars no change need be made except to add overhead equipment. From the company's experience so far, however, it is thought the gasoline car on rails will be the most profitable form of tramway service. The mere fact that each car runs on its own power, and so cannot be stopped by an accident or strike at a central power station is in itself a guarantee of continuous service for the public which cannot be had otherwise, as proved by the tramway strike in Hongkong some years ago. The company considers its future bright. And it has the satisfaction of knowing that it is indeed the mother of the maloos, and that to its inception and operation is due the great impetus for municipal improvement which has been so marked during the past two years in Canton. Regarded at first with some suspicion and conservative hostility, especially by those landowners whose lands were curtailed to make way for the maloos, yet now it is cordially appreciated and supported by all classes in Canton. Land has increased ten times in value where the maloos run, the ricsha coolies now have over fifteen miles additional roads on which they can operate, and hitherto unthought of extensions of business and opportunities for employment have come as a result of the promotion of the tramway idea.

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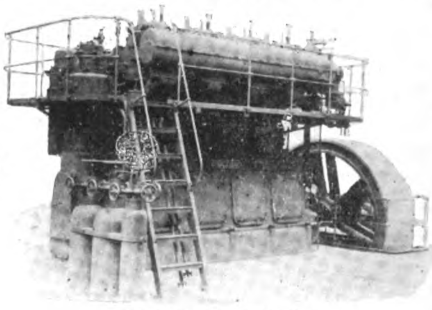

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Uniflow Steam Engines, Upright Watertube Boilers, High and Lowlift Centrifugal Pumps, Fans and Ventilators for all purposes, Fire Engines, STATIONARY DIESEL ENGINES, Direct Reversible Diesel Marine Engines, Ice and Refrigerating Plants, Central Heating, Electro-Boilers, Maag Gear Machines.

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WINTERTHUR. SWITZERLAND.

Motor Transportation in the Philippines

ALTHOUGH the registration of automobiles in the Philippines increased from 8,341 to 9,738 and motor trucks, from 2,722 to 3,053, the general tendency was downward in both the passenger and tonnage movement for 1921. The Manila Electric Company reports a decrease in the passenger movement of 1,954,445 during the year. The Manila Railroad Company, however, reports an increase in tonnage movement of from 806,380 in 1920 to 1,051,551 in 1921, though the passenger movement decreased 2,326,804 for 1921. This reduction, however, is mostly due to the competition of automobiles and motor trucks operating between the city of Manila and near-by provinces.

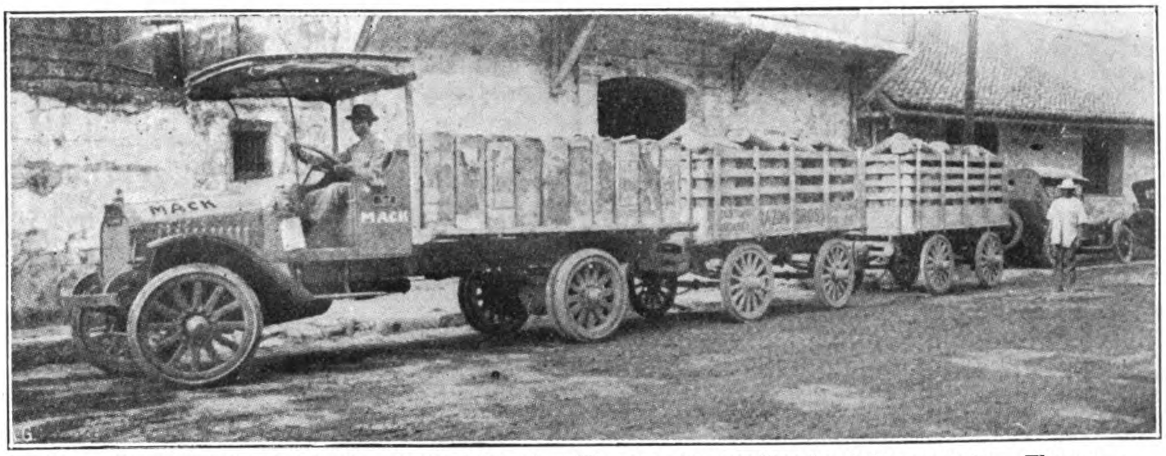
During the year 1921, there was comparatively little road building done on the islands. Only 134 kilometres were added to the system. First-class roads were increased by 159.9 kilometres bringing the total up to 5,066.2; 7.3 kilometres were added to the second-class roads a total of 2,044.8 kilometres, while third-class roads show a decrease of 43.2 kilometres, a total of 3,036.6. The total lengths of roads in the islands is now 10,147.6 kilometres. During the year Pesos 4,546,284 was expended on maintenance and Pesos 8,180,413 on new bridges and roads, a total of Pesos 12,726.697.

The first-class roads are open the entire year for automobile traffic. These roads have permanent bridges and culverts or regular ferry service and are all hard surfaced. The second-class roads are suitable for all kinds of traffic only during the dry season. These are standard width roads but have many temporary bridges and culverts, mostly built of bamboo, many of which are washed out during the rainy season. These roads are partly ordinary dirt roads. Third-class roads are really cart tracks, although a light automobile can use them during the dry season.

There are 1,428 kilometres of roads surfaced with crushed stone: 3,210 kilometres surfaced with gravel: 1,460 kilometres surfaced with coral and 3,818 kilometres unsurfaced dirt roads. The crushed stone used is of several kinds, mostly sandstone and limestone. There are some very good coral roads, but the surface does not last long. An experimental concrete road was put down seven years ago, but it has become badly crushed and the engineers realize that this was caused by not having a proper base. It has been estimated that with a daily traffic of 500 vehicles on a macadam road that the annual upkeep is Pesos 1,000 per kilometre.

There are 7,461 bridges in the islands with a span of about 20 miles, of which about 4,400 are concrete and culverts with about 10 miles span.

Of the 9,738 automobiles registered in the islands, 4,782 are in the city of Manila or about half of the total registered. This, however, does not include motor trucks, of which there are 3,053 registered, 1,280 being in Manila. There are 20 makes of motor cycles with a total registration of 1,093 scattered throughout the islands. The registration list of cars by makers for 1922, compiled by E. M. Mac Intosh of the Goodyear Tire and Rubber Co., shows the following distribution :—



Cargo Transportation in Manila. A Mack Truck pulling two 2-ton trailers loaded to capacity- There are 1,280 trucks in Manila

AUTOMOBILES REGISTERED IN P. I. UP TO APRIL 1, 1922.

Make.	Private.	Hire.	Garage.	Gov'nt	Pub. Ut.	Total.	% of Total.
Dodge	1,281	353	87	80	34	1,835	23
Ford	1,058	433	19	137	35	1,682	21
Buick	737	167	21	3	10	938	12
Hupmobile... ...	445	60	1	26	17	549	7
Overland	361	68	14	3	10	456	5.5
Hudson	367	9	18	3	4	401	5
Chevrolet	135	152	10	1	5	303	4
Maxwell	233	27	26	—	2	288	3.5
Essex	188	3	1	—	1	193	2.5
Willys-Knight ...	137	7	26	1	1	172	2
Studebaker... ...	126	9	1	—	2	138	1.7
Cadillac	85	3	—	6	—	94	1
Nash	84	5	5	—	—	94	1
Chandler	60	2	2	21	—	85	1
Oakland	56	9	1	1	—	67	1
Scripps-Booth ...	65	2	2	—	—	67	1
Oldsmobile... ...	59	—	1	—	—	60	0.7
Renault	57	—	—	—	—	57	0.7
Saxon	39	3	—	—	—	42	0.5
Paige	34	2	—	—	—	37	0.5
Case...	25	—	—	—	—	25	0.3
Peerless	24	1	—	—	—	25	0.3
Briscoe	21	—	—	—	1	22	0.3
Brazier	21	—	—	—	—	21	0.3
Cleveland	21	—	—	—	—	21	0.3
Franklin	18	—	—	—	—	18	0.2
Packard	14	—	—	2	—	16	0.2
White	4	—	—	10	—	14	0.2
Chalmers	12	1	—	—	1	14	0.2
Cole	12	—	—	—	—	12	0.15
Dort	8	2	1	—	—	11	0.15
Panhard	11	—	—	—	—	11	0.15
Reo	10	1	—	—	—	11	0.15
Stutz	10	—	—	—	—	10	0.15
Stearns Knight ...	10	—	—	—	—	10	0.15
King	8	1	—	—	—	9	0.1
Delahaye	9	—	—	—	—	9	0.1
Haynes	5	2	—	—	—	7	0.1
Willys Overland ...	6	—	—	1	—	7	0.1
Winton	7	—	—	—	—	7	0.1
Trumbull	6	—	—	—	—	6	—
Seneca	6	—	—	—	—	6	—
Pierce Arrow ...	5	—	—	1	—	6	—
Elgin	5	1	—	—	—	6	—
Austin	·5	—	—	—	—	5	—
Commonwealth ...	5	—	—	—	—	5	—
Mercer	5	—	—	—	—	5	—
Premier	5	—	—	—	—	5	—
68 other makes ...	130	5	—	3	4	142	1.5
Totals	6,035	1,328	234	299	128	8,004	99.8

98.3 per cent. of all the cars in the P. I. are American makes and only 1.7 per cent. are European.

This list includes 128 passenger car chassis which have been equipped with buss bodies. These chassis have been registered as trucks and are therefore listed among the trucks on the accompanying list. Those include 35 Fords, 34 Dodges, 17 Hupmobiles, 10 Buicks, 10 Overlands, 5 Chevrolets, 4 Hudsons and 13 others.

TRU_KS IN PHILIPPINE ISLANDS BY MAKES UP TO APRIL 1, 1922.

Make.	Private	Hire.	Garage.	Gov'nt.	Pub. Ut.	Total.	% of Total.
Ford	300	113	62	141	247	863	35
White	47	52	8	71	136	314	13
G. M. C.	36	14	25	47	45	167	7
Denby	47	12	9	1	32	121	5
Dodge	29	2	3	7	64	105	4
Packard	19	8	6	20	18	71	3
Clydesdale	23	6	10	—	17	56	2
Truck Trailers	23	3	7	3	7	53	2
Traffic	13	16	—	—	17	46	2
Maxwell	20	13	5	—	7	45	2
Bethlehem	9	29	1	—	6	45	2
Overland	17	3	3	—	19	42	2
Federal	11	9	2	9	10	41	2
Hupmobile	9	—	2	1	23	35	1.5
Buick	9	4	—	—	18	31	1
G. V. C.	—	—	—	30	—	30	1
Troy	23	—	1	1	4	29	1
Gartord	12	8	3	—	6	29	1
Delahaye	14	1	10	—	1	26	1
F. W. D.	—	2	—	19	—	21	1
Hudson	6	3	2	—	5	16	0.5
Autocar	11	—	4	—	—	15	0.5
All American	4	2	—	—	6	12	0.5
Gramm	4	6	1	2	—	13	0.5
Studebaker	4	2	—	—	5	11	0.5
Mack	3	5	—	—	2	10	0.5
Chevrolet	3	—	—	—	7	10	0.5
Alco	—	1	—	8	—	9	0.5
Gen. Vehicle	9	—	—	—	—	9	0.5
Oldsmobile	2	—	2	—	5	9	0.5
Chalmers	2	1	—	—	4	7	0.5
De Dion Bouton	—	—	—	3	3	6	0.5
Reo	3	1	—	1	1	6	0.5
U. S.	3	—	1	—	1	5	—
Renault	3	2	—	—	—	5	—
Peerless	—	—	1	1	3	5	—
Mitchell	2	2	—	—	1	5	—
Doane	3	2	—	—	—	5	—
Dearborn	3	—	—	—	2	5	—
Christie	—	—	—	5	—	5	—
Berliet	1	—	3	1	—	5	—
American La France	—	—	—	5	—	5	—
Day Elder	2	2	—	—	—	4	—
Indiana	—	4	—	—	—	4	—
Liberty	—	—	—	4	—	4	—
Sanford	2	2	—	—	—	4	—
Service	2	1	1	—	—	4	—
St. B.	—	—	—	4	—	4	—
Jeffery	2	—	—	—	1	3	—
International	—	—	—	—	3	3	—
Commercial	—	—	—	3	—	3	—
Brasier	2	1	—	—	—	3	—
Winther	1	—	—	2	—	3	—
Warner	—	3	—	—	—	3	—
Opel	3	—	—	—	—	3	—
Garner	2	—	—	1	—	3	—
40 Other makes	—	—	—	—	—	59	—
Totals	774	357	178	407	739	2,455	

The following table shows the number of motor cycles registered in the Philippine Islands up to April 1st, 1922 :—

Make.	Private-Owned.	Government.	Total.	%
Harley Davidson	176	188	364	45
Indian	209	31	240	29
Cleveland	45	2	47	5.5
Excelsoir	44	—	44	5.5
Smith Bicycle Wheel	32	8	40	5
Dayton	23	2	25	3
Henderson	22	—	22	3
F. N.	8	—	8	1
Briggs	4	—	4	0.5
Pope	4	—	4	0.5
All Others	11	—	11	2
Total	578	231	809	100

42 per cent. of all motor cycles are in Manila and the remainder scattered over the provinces.

51 per cent. of all applicants for license applied for 1 passenger.

38 per cent. of all applicants for license applied for 2 passenger.

11 per cent. of all applicants for license applied for 3 passenger.

There is no record of the number with side cars but the best available authority shows about 40 per cent. of all motor cycles have side cars.

PHILIPPINE ISLAND CAR REGISTRATION FOR APRIL, MAY AND JUNE, 1922.

Registration for 2nd quarter in 1922, April, May and June show the following new cars registered :—

Make of Car.	Registered by: Private Owners	Hire Cars	Gov.	Total New Registration	% of Total
Ford	40	9	1	50	20
Dodge	40	4	2	47	19
Buick	17	2	—	19	7.5
Overland	14	2	—	16	6.5
Studebaker	14	—	—	14	5.5
Chevrolet	11	3	—	14	5.5
Essex	12	—	—	12	5
Willys-Knight	12	—	—	12	5
Cleveland	9	—	—	9	3.5
Hudson	4	—	—	4	1.5
Chandler	4	—	—	4	1.5
Scripps Booth	4	—	—	4	1.5
Hupmobile	4	—	—	4	1.5
Nash	4	—	—	4	1.5
Oakland	3	1	—	4	1.5
Cadillac	3	—	1	4	1.5
Packard	3	—	—	3	1
Maxwell	3	—	—	3	1
Oakland	3	—	—	3	1
Haynes	3	—	—	3	1
Cole	2	—	—	2	1
Stephens	2	—	—	2	1
Briscoe	2	—	—	2	1
14 others	14	—	—	14	3
Total	227	21	4	253	100

PHILIPPINE ISLANDS MOTOR CYCLE REGISTRATIONS FOR APRIL MAY AND JUNE, 1922.

Registration for motor cycles for April, May and June, 1922, in the Philippine Islands are as follows :—

Make of M. C.	Registered by: Private Owners	Gov.	Total New Registration	% of Total
Harley D.	7	29	36	61
Indian	10	1	11	19
Cleveland	4	1	5	8.5
Henderson	2	—	2	3.5
Shaw	2	—	2	3.5
Opel	2	—	2	3.5
Excelsior	1	—	1	1
Total	28	31	59	100

PHILIPPINE ISLANDS TRUCKS REGISTRATION FOR APRIL, MAY AND JUNE, 1922.

Registration for new trucks for April, May and June, 1922, in the Philippine Islands are as follows :—

Make of Truck.	Registered by: Private Owners	Hire Trucks	Gov. Trucks	Total New Registration	% of Total
Ford 1 ton	7	2	3	12	30
Garford	2	1	5	8	20
White	—	2	4	6	14
G. M. C.	—	2	1	3	7
Standard	—	—	2	2	5
Day. Elder	—	2	—	2	5
Denby	—	1	—	1	2.5
Federal	—	1	—	1	2.5
U. S.	—	1	—	1	2.5
Bethlehem	—	1	—	1	2.5
Packard	1	—	—	1	2.5
Mohawk	1	—	—	1	2.5
Dodge	1	—	—	1	2.5
Arcadia	1	—	—	1	2.5
Total	13	13	15	41	101

大正七年七月十日第三種郵便物認可

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

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Development of a Great Industry

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N. E. I. RAILWAYS

Master American Builder in Japan

Siam State Railways

Vol. XVIII OCTOBER, 1922 No. 10

SHANGHAI, PEKING, TOKYO AND MANILA

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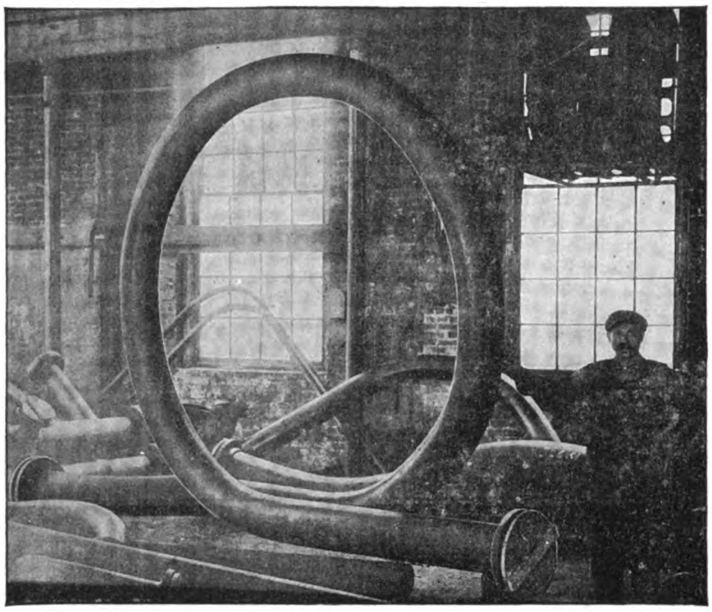

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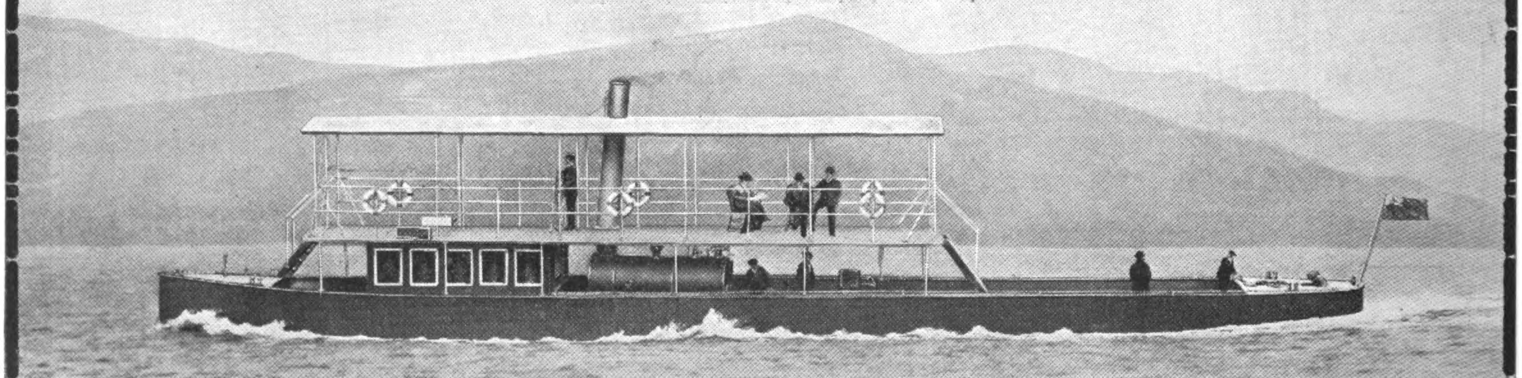

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, OCTOBER, 1922 No. 10

America's Best Customer in Asia

PREVIOUS to the Washington conference the efforts of American financiers and business-men to reach a harmonious solution to our differences with Japan were invariably nullified by the counter activities of Americans in China. As often as our leaders of finance and industry succeeded in bridging the gap between the two nations the fruits of their labors were destroyed by renewed agitation against Japan originating in Peking or Shanghai. We thought that these practices had ceased with the signing of the four and nine-power treaties and Japan would be permitted to live up to her pledges without further nagging, but a recent incident discloses that influences are still at work to keep alive suspicions in the minds of Americans against the *bona-fides* of the Japanese government.

A syndicated article appeared recently in several American newspapers from a local correspondent disclosing that the executive committee of the American chamber of commerce at Shanghai had telegraphed the American minister at Peking urging him to carefully scrutinize the progress of the Sino-Japanese Shantung negotiations in order that American trade interests in that province might not be injured, in other words, to see that Japan did not "put over anything" that might close the door to American trade.

Now, THE FAR EASTERN REVIEW is in accord with any measure for the safeguarding of American rights and interests in this country, but we hold firmly to the belief that our national trade in its broader aspects cannot be advanced by continually impugning the motives and good faith of other nations. We are in hearty sympathy with every movement that tends to strengthen our commercial ties with China, but because of present financial and political conditions in this country, for some years to come our actual trade interests in Japan will be many times greater than our prospects in China. It will bring no lasting benefits to our manufacturers for their agents in this country to lend themselves directly or indirectly to keeping alive a propaganda which had its inception under the Wilson administration and received its quietus only when it had brought the nation to the brink of war with Japan. Americans in China should realize the truth of the old adage that the tail cannot wag the dog. The highest officials of our government and the most prominent of our business-men have stretched their hands across the Pacific to clasp those of their colleagues in Japan. The most perfect understanding exists between Hughes and Kato.

Now, Japan may or may not need watching in Shantung, but as far as American trade in general is concerned, it will be well to give careful heed to the trade returns between the two nations. It will give Americans in China something to think over, as it has the more serious minded of their countrymen at home. The recent publication of the trade returns for the fiscal year 1922, has opened the eyes of Americans to the importance of their trade with Japan and from all parts of the country editors are commenting on the surprising facts therein disclosed.

"Who," asks the *Pittsburg Dispatch*, "outside those directly interested, would suppose that the one important country whose trade with us in the past year, imports and exports, increased was Japan? Yet where our world imports show a fall in value of 28 per cent., those from Japan show a gain of 18 per cent., and where our world exports reveal a shrinkage in value of 42 per cent., those to Japan show an increase of 30 per cent. Japan sent us imports practically equal in value to all those from our neighbor, Canada, which led the list of our purchases. Japan was fourth in buying from us, being exceeded only by the United Kingdom, Canada and Germany; all of which bought less than the previous year, while Japan bought $59,000,000 more and sold us $54,000,000, more than in 1921. Our total trade with Japan in 1913 was only $150,000,000; in the year past it reached $550,000,000."

"Our imports were mostly raw silks; our exports there were largely raw cotton, but the manufactured articles we are selling the Japanese are rapidly increasing. The figures for 1922 are the more significant, when it is known that the prices of two principal articles of exchange, cotton and silk, were about the same as the year before, while all other articles were far below, showing a relatively larger increase in bulk than the value indicates."

The *New York Financial America* also summarizes the above in the following concise statement:—

"Japan is the one important country of the world with which our 1922 trade shows an increase. Our imports from the whole world in the fiscal year 1922, says the *Trade Record* of the National City Bank of New York, show a fall of 28 per cent. in value while from Japan alone, our imports show an increase of 18 per cent. The 1922 exports to the whole world show a reduction of 42 per cent. in value while those to Japan show an increase of 30 per cent. The imports from Japan in the fiscal year 1922 approximate $300,000,000 against $253,000,000 for the fiscal year 1921, and the exports to that country in 1922 were approximately $245,000,000 against $189,000,000 in the preceding year. This estimate of the 1922 trade with Japan, adds the *Trade Record*, is based upon official figures of 11 months while those of the trade with the whole world during the full fiscal year are official."

"If commerce and peace go together as suggested by Thomas Jefferson and proclaimed by Richard Cobden, surely our relations with Japan should be most ironic and cordial, says the *Boston Transcript* in commenting on the above figures.

"For our commercial relations with that country are to-day more favorable than with any other considerable land in all the world. It is the one country with which during the last fiscal year our commerce, in both imports and exports, increased."

"In such circumstances, there should be no thought of war between the two countries. 'Peace, commerce and honest friendship' were the relations which Jefferson wanted the United States to maintain with all nations. They do now prevail between us and Japan. And with the commercial relations so phenomenally prosperous and important, there ought to be no question concerning the other two."

The same sentiments are expressed by the *Pittsburg Chronicle Telegraph* which remarks that

"our trade with Japan has the unique distinction of increasing in both directions, while that with every other important country and with the world as a whole is decreasing. Each of the countries is of great and increasing importance to the other, in dollars and cents, in yen and sen. If commerce is associated with peace and honest friendship, then the bonds of peace and friendship between America and Japan should now be strengthening to a gratifying degree."

The great possibilities of the Japan market for our raw cotton, the opening of Japanese cotton buying houses in Texas combined with direct steamship connections which Gulf ports manufacturers expect will increase their sales to the Far East, leads the *Houston Post* to say that

"there are undoubtedly large possibilities for American trade with Japan, and the South has an especial opportunity to share in the benefits. Commercial relations will be enlarged as the political friction between the nations is removed, and they come to a better understanding of each other's peaceful intentions.

"The disarmament conference at Washington accomplished much for better relations between America and Japan. In fact, with the exception of bringing about the limitation of naval armaments by agreement, the development of a new feeling of friendship between these nations was the most important result of the conference.

"With the exercise of discretion and the spirit of fair play, the United States and her neighbor across the Pacific can build up a great trade between them which will be mutually profitable. Americans will be wise to follow the leadership of the buinsess man instead of the politician or the military alarmist in dealing with Japan."

From the Pacific northwest, Japan's purchases of lumber has been the one bright spot in an export trade that otherwise "was on the bum," and spelled prosperity to many concerns where losses were the order of the day. The *Tacoma Ledger* reflecting opinion in that quarter remarks:

"The Pacific coast is vitally interested in Asiatic trade. In fact, it is beginning to be recognized that this coast must look toward the other side of the western sea for the expansion of trade that will make it commercially great—it is in Asia that the commercial future of the Pacific coast lies. The phenomenal growth of trade with Japan during the present year may well be taken as an indication of what may be looked for as time passes, when Pacific coast shippers and manufacturers have worked for the upbuilding of markets of unusual promise.

"The figures are striking because of the fact that they demonstrate possibilities for the future. The Pacific Northwest, with its lumber and timber products, its grains and other staples, may well look more to the Orient for a market, and the course of trade during the past decade is ample assurance of commercial prosperity for the future if the Oriental markets, with their potentialities, are properly cultivated."

From other parts of the country comes the same refrain.

Simultaneous with the general interest displayed in the publication of the official trade returns, Secretary Denby arrived in the United States from his tour of the Orient, and gave Japan a clean bill of health with respect to her friendliness and attitude towards the four-power treaty. Mr. Denby said:

"I believe that Japan is living honorably to every detail of her obligations under both treaties. I was much impressed with the confidence exhibited by the Japanese in the success of the pacts and believe that Japan, as well as the United States, has come to realize that the new international arrangements in the Pacific are beneficial to everybody concerned. I also noticed similar feeling in China."

At a time when American editors were rejoicing over the closer understanding brought about through increased trade and a member of Harding's cabinet was hurrying home to testify to the good faith and honor of Japan, the American chamber of commerce of China is made to say by a publicity agent that Japan cannot be trusted to live up to her pledged word, without close scrutiny on the part of Americans.

At a time of great world trade depression when American exports to all other countries shrunk in value 42 per cent., those to Japan increased 30 per cent. As our best Asiatic customer, Japan turned the scale for many American manufacturers in one of the worst years in the history of world commerce. Under these conditions it is difficult to understand why Japan should bear special watching.

The trade returns quoted above, however, give only half the story. The real situation is revealed in a study of the trade of Japan with special reference to that with the United States published as a special monograph by the United States Tariff Commission, under the title "The Foreign Trade of Japan." In this new revised survey of the trade of Japan the statistical information has been brought up-to-date and new material included. Section four of this valuable report is devoted to a general study of the trade of the United States with Japan and includes a comparison of the relative value of the trade of each country, with war and post-war changes and a somewhat detailed analysis of the trade movements of the more important commodities and groups of commodities.

The remarkable fact is brought out that "notwithstanding the tremendous increase in trade with other Asiatic countries, especially as measured by percentages, Japan has been and is the main source of supply for the American imports coming from Asia. Since 1917, the imports from Japan to the United States have been about double those coming from any other Asiatic country. Correspondingly, Japan affords a larger market for the United States exports than any other Asiatic country, and in the more recent years the relative importance of this market for the United States has increased slightly. If the trade of Asiatic Russia, largely a war product, be excluded, during the last few years Japan has taken with an occasional exception, from three to five times as much of the American exports as has any other Asiatic country. China has been the second largest market for the United States exports in this region, according to official statistics, though falling far below Japan in this respect. However, a certain part of the United States exports to Japan is re-exported and finds an ultimate market in China or other Oriental countries."

It is difficult to go behind these figures. The official findings of the United States Tariff Commission supplements the trade returns for the past fiscal year and brings home to the American people the vast importance of their trade with Japan and of the necessity of preserving the most friendly relations with such a good customer. American trade with China has also assumed large proportions and will increase with the purchasing power of the people In time, no doubt, it will be the greatest market for manufactured products in Asia. Every legitimate means within our power should be employed to encourage its development, but if our gains in this direction are to be offset as the result of political agitation against Japan by a corresponding decrease in our trade with that country, it is simply transferring the profits from one pocket to another.

The report of the U. S. tariff commission will go far towards educating Americans to the fact that the vast latent possibilities of the Chinese market cannot be compared with the immense immediate profits awaiting our merchants and manufacturers in the Japan of to-day. The sober, common sense of the American people will insist upon a discontinuance of a campaign which tends to alienate the good-will and friendship of a customer whose trade, according to the highest expert advice, is worth three to five times as much as that of any other Asiatic country.

* * *

Keep All the Doors Open

It was eminently proper for the executive committee of the American chamber of commerce to suggest to its minister at Peking to watch the Shantung negotiations in order that their interests be not impaired, in the same way that similar resolutions on other matters are conveyed to the proper authorities, but it was eminently improper, to give this confidential resolution to a press correspondent who immediately utilized the information as the basis of a long article which conveyed to the minds of the people of the United States that Americans in China placed no confidence in the honor of Japan. As this is the second time within the year that confidential discussions of the executive committee of the American chamber of commerce have been immediately imparted to publicity agents of the Peking government, it is time that notice be taken of methods which for all practical purposes makes the chamber an adjunct to the Chinese publicity system. These tactics are out of date, opposed not only to the policy of the American government but to the higher interests of the American manufacturer at a time when his trade with Japan is the brightest signboard on the tortuous highway to prosperity.

Keeping the door open in China is a strenuous job, and for the past few years the watch-dogs of American commerce have been concentrating their attention upon the activities of Japan to the exclusion of other equally important trade matters in other parts of Asia. If the interests of the two or three *bona-fide* American concerns established in Shantung are of sufficient importance to move the executive committee of the American chamber of commerce to bestir itself to see that they are fully protected in open negotiations having for their object the restoration of the province to Chinese sovereignty, then the precedent should be followed in all similar diplomatic dealings between China and other governments. Not long ago, press dispatches from Peking carried the information that Foreign Minister Dr. Wellington Koo had ordered all the documents bearing on the Tibetan controversy to be gathered for his information preparatory to resuming negotiations with the British government for a settlement of this outstanding question. It would be eminently proper for the watch-dogs to introduce a resolution in the American chamber of commerce that these negotiations also be most minutely scrutinized for the

protection of American firms in Szechuan dealing in Tibetan produce, whose interests are equal to, if not greater, than those American firms operating in Shantung. There may be an American or near-American firm established in Gartok, in Gyangtze, or out in Kashgar, for all we know, whose interests demand that their rights to equal opportunity be not imparied in any negotiations between Great Britain and China, especially when the terms of the original Tibetan convention are called to mind. Within the next decade or so, the world will turn more and more to central Asia and the Roof of the World for its supply of valuable minerals and oil supplies, and the clause which closes this *eldorado* to foreign mining concessions would then constitute a most flagrant violation of the rights of Americans to equal opportunity in the development of this vast region.

The gold fields of Tibet are reputed to be enormously valuable, and with aerial transportation, the time may not be far distant when the world will draw on these hitherto untouched deposits. So Americans might as well bring this to the attention of their official representatives and insist upon close scrutiny of any negotiations between China and Great Britain, in fact, we ought to have a delegate sitting in at the meetings to be sure that nothing is " put over " that will help the climate to freeze us out of Tibet.

We are also positive that the interests of the few American trading concerns in Mongolia are of far greater importance than those of the two or three established in Shantung. Does not the most important American concern in China have its branches in Kalgan, Urga and elsewhere in Mongolia ? Did not Americans open up this country by establishing motor services across the wastes and are not various American concerns in Tientsin deeply interested in its development ? In order to play the game all around, the American chamber of commerce of China should call upon its minister to see that the Soviet does not close the door to American trade in this region. In order to support the policy of the American government laid down so emphatically during the organization of the consortium, Russia should be given firmly to understand that we will brook no nonsense in Mongolia, a most important part of the Chinese republic.

American trading interests are quite large in northern Manchuria and eastern Siberia and unless the American chamber of commerce does not wish to go on record as singling out Japan for their suspicions, the American minister should at once be invited to keep a close eye on the Changchun or any future negotiations. One never can tell about a government which forcibly takes possession of and drives American traders out of a vast territory and stations its troops in Urga in violation of China's sovereignty, especially after the American government was so explicit in defining the status of this territory when pressure was being exerted upon Japan to conform to our ideas. Why not bring a little pressure to bear upon Russia and the Far Eastern Republic to compel adherance to the consortium policies ?

And while we are at it, let us keep a weather eye on the future of American trade in Yunnan. We were recently asked by an American manufacturer what the chances of success were if he opened an agency in Yunnanfu, and would he receive equitable treatment on the Yunnan railway. As we were ignorant of the exact situation in this corner of China, we were unable to answer his question. Now, it would be highly commendable if the watch-dogs of the " open door" would stop barking at Japan and concentrate their attention for awhile on these other matters. At least, let us be impartial in our suspicions and when we pass such resolutions let us give the same publicity to them as we did in the case of the Shantung affair. We are certain that the large American firms operating in Mongolia whose agents have been forced to flee before the ire of the Bolshevists will deeply appreciate such a resolution and the American firms up in Chungking, Tachienlu and Batang, not to mention the solitary trader in Gartok and the lone storekeeper at Gyangtze, will feel easier when they know that some one in Shanghai is keeping an eye on Great Britain in Tibet.

G. B. R.

SUN YAT-SEN

Will China Come Under the Influence of Germany and Russia, or Drift Into an Alliance with Japan ?

THE *Hongkong Telegraph*, in an " exposure " of Sun Yat-sen, says that the failure of one of his subordinates to burn certain secret documents as instructed by his chief, has led to the discovery of a startling scheme for the creation of a triple alliance between Germany, Russia and China, based, there is little doubt, on bolshevik ideals. The papers, according to the *Hongkong Telegraph*, are incriminating to the point of absolute conviction and show that Sun Yat-sen has been a prime mover in the scheme for the carrying out of which he has been indirectly in league with Admiral von Hintze, the former German minister to China. The *Telegraph* concludes its exposure of these documents by saying that all who value the integrity of China and who are anxious for the country's welfare should from now on hesitate to place faith in a man who works hand in glove, secretly and in dark ways, with the spreaders of doctrines of a most destructive character. In conclusion, the paper states, that it will be surprised if Sun Yat-sen is any longer permitted by the French authorities to reside in the French concession in Shanghai, where he is likely to carry on the negotiations which were somewhat abruptly terminated by the recent upheaval in Canton.

We are going to assume that the evidence unearthed by the *Hongkong Telegraph* is genuine. THE FAR EASTERN REVIEW has steadily supported the leader of Chinese liberalism for many years, because we are convinced to our satisfaction that he is honest, capable in many ways, and inspired with love of country and the establishment of principles that no honorable Anglo-Saxon can criticize. We have followed his career with a greater interest and sympathy perhaps than any other journalist, and are convinced that he has failed to receive a square deal either from Peking or from the outside. We have watched the campaign to discredit him from its inception in 1913, and can, if necessary, trace much of the malicious propaganda to its original sources. The pettiness of it all is disgusting.

If it should develop at this time that Dr. Sun Yat-sen is flirting with the Russians and Germans it is not strange when it is recalled that much of his political misfortunes are traceable directly to the intervention and meddling of other powers in the domestic affairs of China.

Dr. Sun started honest, friendly to the liberal powers of the west from whom he absorbed his political ideas, and with an earnest intention to apply a democratic form of government to China. He unselfishly resigned the provisional presidency in favor of Yuan in order to avoid further internal strife and accepted the difficult task of restoring China's sovereignty over her railway system. From the very start he was ridiculed and scoffed at as a dreamer, not so much because of the extent of his original scheme, but from the fact that his success meant the abolition of the closed sphere doctrine, the restoration to China of her sovereign rights to control her own transportation system. The advocates of special privilege saw

their hopes fade away with the development of Sun's plans and the concentration of future railway construction under one independent bureau removed from the influence of party politics and the pressure of the legations at Peking. Sun's success foreshadowed the collapse of the elaborate structure erected by foreign powers for the control of China's internal development, and under given conditions, the partition of the country into spheres of political control. It was natural that he should receive little sympathy from a foreign press intent upon defending the system which underlaid the policy of their various governments. Sun was called a dreamer, because no foreigner could visualize his plans from a patriotic Chinese viewpoint. No one can accuse Dr. Sun Yat-sen of being anti-British in those early days when he was trying to finance his railway scheme. As a matter of fact, the only beneficiary of his scheme was the British firm of Pauling & Company who received the contract for the Canton-Chungking railway, a fifteen hundred mile line, subsequently changed to the one from Shasi to Singyfu. When the news was cabled to London that he had started the second revolution and his powers were revoked, three other British firms were ready to sign agreements for thousand mile railway contracts on the same terms as those arranged between Pauling & Company and Dr. Sun Yat-sen. With the exception of one contract in France, British interests would have been the sole beneficiaries of Dr. Sun's much criticized scheme. Yet Sun's most bitter critics were certain British journalists who, as subsequent events have proven, were more interested in preserving the field for the official monopoly than in having independent British concerns enter into competition with it. By common consent, the advocates of special privilege came together to denounce him, sneer at him and undermine his reputation. The ball that was started rolling in 1912 has never stopped. The men who started the libel have stooped to the vilest calumny against their old friend in order to solidify their positions with their military employers.

Lured by the offer of fat jobs from the Peking government, many of his trusted lieutenants deserted his standard and justified their treason by proclaiming his incompetency in practical statesmanship. These men, many of whom are now occupying high positions throughout China, are his most bitter enemies, knowing that if he should emerge from his political campaigns as president or premier, their days of usefulness are numbered. Fear of the consequences, brings this group together in a solid phalanx to keep him down by any and all means within their power, and foreigners attached to them in one capacity or another have taken up the fight against Sun in order to preserve their own positions. This lies at the bottom of much of the hostility towards Sun Yat-sen.

During the first revolution, Sun Yat-sen was not unfriendly to Japan, in fact, several Japanese accompanied him to China and were attached to his staff at Nanking, much to the disgust of others who aspired to influence his policies. Dr. Sun realized better than any other Chinese official the great menace to China's integrity concealed in the unchangeable imperialistic policy of Russia and was the only Chinese that we know of who took to heart the rape of Mongolia and started a movement for its recovery. His much criticized financial scheme which contributed so largely to his loss of prestige as a practical statesman was devised to supply the funds for carrying on a military campaign against Russia for the recovery of Mongolia and the full restoration of China's sovereignty in the Ili and Sinkiang regions. Sun had no illusions about the ulterior motives of Russia and in all his railway schemes insisted upon the inclusion of lines which would terminate on the Siberian borders and open up Mongolia to the colonization of his countrymen. Too well indeed, did Dr. Sun sense that if Russian policy laid down so emphatically in the protest against the construction of the Chinchow-Aigun railway, was permitted to stand unchallenged, sooner or later Northern Manchuria, Mongolia and Sinkiang would be brought under the rule of the Czar. Russia had declared that the construction of any Chinese railway which endangered her strategic position along the Amur river would be considered as an unfriendly act, and this principle was extended to all other lines which might consolidate China's authority over her far-flung border lands. Russia could build railways that impinged upon the sovereignty of China, but China was prohibited the right of building any lines within her own borders which might in any way be construed by Russia as inimical to her plans of conquest. China was meat for the Bear, but to our certain knowledge not one Chinese official ever fully sensed the danger or took steps to save the nation from the menace, until Dr. Sun boldly traced the projected Mongolian railways deemed essential to the safety of his country. And in his subsequent exhaustive studies of China's development he elaborated these plans to show the necessity of opening Mongolia to Chinese colonization. There was nothing pro-Russian about Dr. Sun Yat-sen up to one year ago. If he has changed since then, there must be some good reason to explain such a *volte face*.

Let us go back to the original reorganization loan of 1913 forced through by the powers against the repeated protests of the Kuomintang and which provided Yuan Shih-kai with the millions to consolidate his power as dictator and enabled him to lay his plans for the overthrow of the one political party that opposed his dreams of autocratic rule. Dr. Sun had no illusions about the use these millions would be put to, and in the early days of 1913 sent telegram after telegram to London, Washington, Paris, and Berlin protesting against such an enormous advance to Yuan. President Wilson alone refused to join in this so-called administrative loan, though for reasons entirely of his own, and with little thought for the preservation of democracy in China. The loan went through and within a month the leader of the Kuomintang party (Sun Jao-ren) was murdered in cold blood by the emissaries of Yuan. Yuan's purpose was revealed and Sun started the second revolution, was defeated at the outset, proscribed, forced to flee the country and live in exile in Japan. The parliament was soon afterwards dissolved and the Kuomintang leaders and members hounded out of Peking or thrown into prison. The reorganization loan did exactly what Dr. Sun feared it would do. It killed democracy in China and ushered in the era of militarism which for ten years has desolated the country and brought the government face to face with bankruptcy and foreign intervention. Who was to blame ? Let those who were foremost in supporting Yuan Shih-kai because they desired a " strong man " at the head of the government, search their consciences and answer it to their own satisfaction.

Then came the memorable days of 1917, when America entered the war against Germany and Wilson invited the neutrals to line up on the side of democracy.

China lay disorganized with the militaristic crew battening on the life blood of the people and striving to unloosen the purse strings of American financiers in order to add to their store of ill-gotten wealth. China had no heart for a war with Germany. She had no particular quarrel with that country and made clear her wish to be let alone. But foreigners in Peking playing upon her hopes and fears and holding out the inducement of being placed upon a plane of equality with Japan at the peace conference, forced the president to reluctantly sever relations with Germany.

Sun Yat-sen and his party were opposed to China's entrance into the war, not because of any special love for Germany, but from the fear that such a step would increase the power of the militarists and destroy any hope of reviving a parliamentary government. His fears were realized. Democracy in China received a set back from which it has not yet and may never recover. China did not enter the war of her own free will. The president was literally forced into it, bullied by the celebrated " Flying Wedge," and when all other suasion was found useless, was threatened with civil war in the Yangtze if he held out for neutrality. The hope of participating in the American war loans to the allies reconciled the Peking militarists to finally declaring hostilities, yet at all times the southern parliamentary party vigorously protested against a step they well knew would eliminate them as a factor in the government. The allies virtually placed Sun Yat-sen in a position where the force of circumstances brought upon him the suspicion of being pro-German. When the subsequent Japanese loans to Peking provided the funds for breaking the backbone of the parliamentary movement it told Dr. Sun that the cause of liberalism in China had

no friends amongst the nations who were loudly proclaiming their intention of making the world safe for democracy. At the very time that President Wilson was calling upon the manhood of America to make the great sacrifice in behalf of our ideals, the American minister at Peking, by forcing China into the war, effectively gave the death blow to democracy in China. Principles that applied in the west did not apply to the east. Democracy in China was crushed under the heel of a militant autocracy in order that democracy in Europe might triumph.

Up to 1918, Dr. Sun was most friendly to Japan, but when loan after loan was made by Nishihara to Peking, strengthening the power of the military autocrats and enabling them to carry on an active campaign to bring the south under subjection, his sentiments towards that country underwent a marked change. From a friendly ally he became a bitter enemy, and has since justified his uncompromising antagonism to any understanding with the north on the ground that the Peking authorities were sold body and soul to Japan.

It has never occurred to the Chinese or to the many foreign critics of Japan that these loans were eminently proper from the viewpoint of the Japanese government which was financing a partner under a "War Participation Pact" entered into for the express purpose of defending both China and Japan from the spread of bolshevism in eastern Asia. In the same manner that Great Britain first and America afterwards financed their allies in Europe, so Japan tried to build up an effective military force in eastern Asia for defense purposes. The menace from the north overshadowed in importance the long drawn out civil disturbances and revolutions in China and Japan had no option but to treat with the recognized government at Peking and bolster it up in order that it might co-operate in checking the onward rush of the red wave of terror. It is lamentable that much of the funds so advanced were employed against the south. It is the one reasonable complaint that Chinese or foreigners have the right to make against many of these much condemned Japanese war-loans to Peking. There may have been many ulterior motives behind these loans, we do not defend them, but the outstanding fact will remain that the Japanese government directed by a military premier, the highest officer of the army, was fully justified in time of war to take every precaution financial and strategic to assure the close co-operation of China's northern military leaders in any measures for the common defense of both nations in northern Manchuria and Mongolia, and, if in due course of time, the question of the validity of these loans is ever brought before an international tribunal, the verdict will be given to Japan. When the fierce opposition to these loans and the war participation pact is recalled, the impression is created that foreigners in Peking would gladly welcome the ascendency of Russia in eastern Asia rather than see China and Japan co-operate to protect their mutual interests.

On every side interference on the part of the allies only helped to perpetuate in China the system they were fighting to eradicate in Europe. Human nature being very much the same the world over, it is only natural that Dr. Sun and his friends should view with increasing suspicion the professed good-faith of nations who repudiated in Asia the principles they were struggling to uphold in Europe.

And when Dr. Sun went to Canton and established himself as president of the southern republic, determined to oppose force with force, he carried with him the enmity of nearly every foreign writer in China. Instead of a friendly or kindly word of encouragement or sympathy, any slight approval of the principles he was struggling to give effect to, principles that are dear to the heart of every Anglo-Saxon, upon which their very liberties and governments are founded and for the preservation of which they are willing at a moment's notice to lay down their lives, he was reviled, insulted, ridiculed and attacked from all angles. Not once was a friendly word uttered in his behalf by the Peking correspondents of a foreign press whose policies they influenced. Never in the history of journalism has such a malignant campaign been waged to destroy the character and standing of a political leader, as that directed against the protagonist of democracy in China.

Americans and Britons alike, men who cheerfully and proudly did their bit in France to uproot German military autocracy, on their return to China forgot the principles they hazarded their lives to uphold and joined in the pack that barked and yapped at Sun Yat-sen in order to ingratiate themselves with the military outlaws and freebooters who had usurped the power of government at Peking. Dr. Sun had his faults, but he stood for principles that demanded the respect and sympathy of all honest Americans and Britons. Betrayed, villified, hounded and distrusted by those whose doctrines of government he was struggling to implant in China, abandoned and condemned beforehand as a political adventurer by the representatives of the liberal powers at Peking, finding himself rejected by those he had every right to expect support from, can Dr. Sun Yat-sen be condemned, if he turned in desperation to Germany and Russia ?

Foreigners refused to recognize him as a leader of democracy : they stubbornly extended their recognition to the military oligarchy that is Peking, and denounced him as a political fakir, a firebrand, a Mazzini and an upstart demagog. If Sun Yat-sen turned towards socialism, or communism, and sought political leadership through the organization of the Chinese workers, who is to blame for his conversion, or backsliding ?

Since the Paris peace conference, THE FAR EASTERN REVIEW time and again, in season and out, has called attention to the trend of Russia and German policies in Central Asia. The only bulwark against the spread of bolshevism and the development of the Russo-Germanic designs in this region was the army of Nippon co-operating with the armies of China. An intense, blind jealousy of Japan brought all the allies together to frustrate such a combination. Japan's plans for the defense of eastern Asia against the "come-back" of a Teutonized Russia were vetoed by the powers, led by America. She was compelled to forego the military alliance with China and to surrender to the consortium her rights to defend herself. Japan was hamstrung in Manchuria and Mongolia while the way was opened and smoothed for the Soviet to take up the old policies of Russia where the ministers of the Czar left off. The consequence is seen in the occupation of Urga by a red army with the road open for further advances by the weakness of China and the withdrawal of Japanese troops from Siberia and northern Manchuria. With their eyes wide open, Britain, America and France made it impossible for Japan to guard their interests in eastern Asia and for all practical purposes invited the Soviet and Germany to step into the field and carry out their program in China.

Dr. Sun's deep rooted conviction that he is personally opposed by British interests and abandoned by America, and with his hatred towards Japan for her loans to the northern militarists, and with the knowledge that Japan's power for aggression has been circumscribed by the consortium pact and the Washington treaties, has prepared the way for Germany and the Soviet to bring him under their influence. Here we have the aftermath of ten years of bungling diplomacy, a decade of meddling with the affairs of China that has led to a situation portentious with grave events.

If Dr. Sun Yat-sen has actually reached some understanding with von Hintze and Moscow, and in time comes into power and brings about a Sino-Russo-Germanic alliance, who is to blame ? American and British jealousy made a Sino-Japanese understanding impossible and now they must face the possibility of a sovietized China directed from Berlin. Well may the meddlers of Peking tremble at the thought of the consequences. They have willed just such a catastrophe by their stubborn opposition to Japan.

We have stated a case without bias. We do not uphold Dr. Sun. If it turns out that the disclosures of the *Hongkong Telegraph* are true to fact, and it is proven that Dr. Sun has engaged in secret negotiations with Berlin and Moscow to bring about an alliance between the three nations, he forfeits any further sympathy and support from Americans, Britons and Japanese, but this cannot eliminate him from a front place in Chinese politics or prevent him

from carrying forward his program for organizing the workers of China along socialistic or even communistic lines. The damage has been done. Western liberals have turned their backs on the leader of Chinese democracy. They may have to pay the price, whatever it may be. By our meddling we have only made it harder for China. We have thrown the burden once more upon Japan who will be called upon to be the goat for the mistakes of a clique of professional agitators and literary diplomats.

It may be difficult to stem the socialistic or communistic movement in China, it may be impossible to keep Sun Yat-sen forever from acquiring power, and the day may well arrive when the bunglers of Peking will be face to face with the necessity of choosing between a China directed from Moscow and Berlin or one allied with Japan. The choice may have to be made. A sovietized China allied with Russia and Germany means the spread of the movement towards India, the goal of Russian and German political avarice. By their opposition to the renewal of the Anglo-Japanese alliance the British in China will find themselves in a serious predicament, compelled to choose between a China dominated by their traditional enemies or by the ally they discarded in order to cement their friendship with China. If such a time ever arrives and Japan is once more called upon to step into the breach, Great Britain will pay the price demanded by Japan. The question may well be asked, how far Japan is expected to sit by with her hands tied by pacts and agreements while Germany, Russia and China are preparing plans for her undoing ?

In our humble opinion, Americans and Britons in China have committed a grave error in rejecting Dr. Sun Yat-sen as the leader of China's republican movement. We incline to the belief that it is not too late to remedy the past by extending support to him. We believe that Sun Yat-sen would much rather march in harmony with the liberal nations of the west than with the radical powers of Europe, and that the time has arrived to call a halt to the campaign of villification that must have inclined him to listen to the overtures of the enemies of democracy. It is much better for America, for Great Britain and Japan to have Sun Yat-sen on their side than allied to their enemies. Sun is generous, big-hearted, and amenable to reason, to good advice. We cannot eliminate him as a factor in Chinese politics. We cannot break his hold over a large section of the masses of this country. Instead of alienating his friendship why not try the other method and cultivate and assist him in his herculean task of implanting a democratic form of government on the ruins of a military autocracy. It is much better this way than by forcing him into the arms of Berlin and Moscow, and having to face the possibility of asking Japan to defend our interests in eastern Asia. If the *Hongkong Telegraph* is correct, the choice lies before us.

G. B. R.

* * *

Since the above was written, Dr. Sun Yat-sen has issued a statement in which he admits having entered into the correspondence disclosed by the *Hongkong Telegraph*, but insists that the translation is garbled, and, as an offset to the charge that he is in favor of communism, invites attention to his recent work entitled "The International Development of China" which rests primarily on the support of the great financial powers. In his opinion, both Germany and Russia under their new forms of government have ceased to be a menace to the integrity of China and because of this he would have a more perfect working understanding with them. Dr. Sun, however, failed to make any mention of the presence of a large Russian force in Urga which has repeated the rape of 1912 by usurping the sovereign powers of China in Mongolia. He was ready to fight Russia at that time to restore the dependency to China, and staked his political reputation in a scheme for financing the army that was to drive the Russians back to the Urals. Dr. Sun seems to ignore that the continued presence of a large Russian force in that region must sooner or later give rise to complications that may not be so easy to settle by conferences around a table in some luxurious hotel. We see no reason to modify our opinions after reading his public statement. If Sun Yat-sen has been driven to seek a closer understanding with Germany and Russia is it not because Americans, and British have made it impossible for him to hope for any friendly support from the champions of democracy in the West ? Sun has one grand dream : the development of China, the building of railways, of ports, of factories, mills, steel plants and the opening of mines. This is his one obsession. It is hardly likely that he would jeopardize the industrial future of his country for the sake of an alliance or understanding with the two nations in the world who at this particular time are impotent to further his plans. We still believe that the best interests of America, of Great Britain, of France and Japan will be advanced by extending support to his plans for the unification of China under a liberal and democratic form of government.

Unifying American Interests in China

IF there is one thing that American interests in China need above all others it is unification, the will to pull together and work for the common good. For the past eighteen years we have lost opportunity after opportunity because of the absence of an intelligent and practical policy, and because clique after clique has attempted to impose its will upon the government. Some of the most promising and important projects which would have placed American interests in this country on a par with those of Great Britain, have been knifed by petty governmental jealousy and support to Wall Street favorites. For many years the big things of China have been maintained as a close preserve for special interests, and the interloper, the rank outsider, could hope for little support from officials in Washington allied with the system. Under the last administration American participation in the development of China became largely the particular perquisite of specially invited and favored combinations, with the consequence that the field became hermetically closed to large contracts requiring Chinese governmental guarantees. In purely commercial circles American policy has been moulded by a close inside combination which at times has resorted to the most questionable methods in order to force acceptance of its viewpoint. Common sense and sound business principles were swept away by a wave of sentiment, an appeal for Chinese trade based on political reasons. American business with the Chinese government has been conducted on a basis which reflects little credit on the judgement or ability of those responsible for the present situation.

The silly sentimentalism of a past *régime* in our Far Eastern diplomacy, brought us to the verge of war in the Pacific and it required the combined efforts of every sensible republican statesman to ward off the calamity and restore good relations with Japan. In the same manner, as Secretary of State Hughes was compelled to take heroic measures in diplomacy, so Secretary of Commerce Hoover is now forced to institute measures that will protect the investments and ensure payment for American materials delivered to the Chinese government at a time when we were officially advised that its credit was so good that no security was required for bonds sold on the American market, and that it had so much ready money that it could pay cash for everything it required.

The Chinese government now owes to American financial and manufacturing interests approximately $30,000,000 gold, and to

affect a unification of these debts, Secretary Hoover has appointed an advisory committee of industrial leaders, whose duty it will be to suggest a practical plan whose object is to place the American interests on an equal footing with those of France, England, Japan and other countries, which present a solid front when the interests of any national is concerned.

The personnel of the committee, which represents companies owning the major portion of the doubtful Chinese debts, is: M. A. Oudin, International General Electric Company, Schenectady, N. Y.; Charles M. Muchnic, American Locomotive Company, New York; E. S. Glines, Lam, Glines & Co., New York; A. I. Esberg, vice-president of the San Francisco chamber of commerce, and Frank Waterhouse, Frank Waterhouse & Co., Seattle.

The foreign debt of the Chinese government is approximately $100,000,000, one-third of which is owing to American interests. The department of communications owes American concerns $16,000,000 gold for railway supplies, ministry of finance owes two American banks $11,000,000 gold for loans and $3,000,000 gold are scattered debts, all insufficiently secured and the stringent condition of the Chinese treasury makes its necessary that steps be taken to obtain more adequate security, at least.

The advisory committee will make a thorough study of the entire situation and make recommendations to Secretary Hoover regarding the interests of all American nationals and the best way to protect them. Mr. Hoover will then take the matter up with the department of state.

Heretofore, creditors of China in the United States have had more or less to look out for their own individual interests, while British interests have acted solidly through their effective organization backed up by a national trade policy. Other countries have combined their interests in like manner, thus being able to make a much deeper impression on the sorely harrassed Chinese financiers.

It is hoped that, when the Chinese begin receiving the additional revenues from the per cent. increase in import duty rate granted by "Nine Power Treaty on Chinese customs duties," a sufficient amount of these revenues will be appropriated to adequately secure American debts. By solid representation it is believed this can be brought about, and possibly interest charges secured.

Not only in the funding of present debts will the scheme benefit American interests. Instances have occurred where American concerns have been sorely handicapped by "crossing wires" in their dealings with the Chinese. One case was cited where one American firm, bidding on an electric tramway franchise in Harbin, had secured an option from the concessionaire and signed a preliminary contract. Another firm, also American, came in and made certain promises, and secured the contract. This threw the matter into a lawsuit, and the present status is that both American firms are very likely to lose the franchise to unified Japanese interests. Many such cases have occurred.

The committee will also act permanently in an advisory capacity to the Far Eastern division of the department of commerce in the dissemination of information received by that division. It will make a careful study of all matters appertaining to the Orient in order to be in a position to report on any matters put up to it by the department.

It is to be earnestly hoped that the appointment of this committee will be the first step towards a real unification of American interests in China that will extract American business from the mire of international politics and sentiment and place it on a sound practical working basis. As long as politicians, political advisers, propagandists, agitators and biassed sentimentalists are permitted to dominate or influence American business and financial matters in China, we can hope for little real progress.

Leonard Wood

LEONARD WOOD will remain at his post as governor-general of the Philippines "so long as he feels his presence is essential to the success of his program." This is his answer to the question of who will be his successor, a matter which has agitated political circles in Washington as the time drew nigh for him to enter upon his duties as president of the University of Pennsylvania.

Once again Leonard Wood sacrifices his ambitions and personal welfare in response to a call to public duty, sticking to the task he started until it is completed. His presence in the Far East the past year has been a Godsend to American prestige and influence. He has exerted a marked influence in stabilizing the uncertain international political situation. Working in close harmony with Warren in Tokyo and Schurman at Peking, the trio have been as towers of strength to Harding and Hughes in restoring the balance in the Pacific and infusing new life in American diplomacy. This phase of his work has been overshadowed by his accomplishments in the Philippines, but in our opinion it will stand as one of his greatest achievements.

From the time he started on his tour of investigation he made his influence felt for peace and harmony in the Pacific and at least one of our most prominent anti-Japanese leaders who was aboard the steamer which conveyed the Wood-Forbes party to the Orient experienced a change of heart. General Wood's trip through China where he saw conditions at first hand, and his subsequent visit to Tokyo was in reality the first step in making the Washington conference a success. In Tokyo, for the first time in the history of American-Japanese relations, the military leaders of both nations sat around a table and talked in the language that men understand. Both sides understood each other perfectly, and with a clear conception of each other's viewpoint, the way was paved for the dip lomats to put on the finishing touches and write the pacts which have brought the two nations into the most harmonious relations. The return visit of General Tanaka, the leader of the military party in Japan, to Manila, cemented the understanding. The glory goes to the diplomats, but it is safe to say that if the preliminaries had not been thoroughly thrashed out by the fighting men, in which each side made known its irreducible minimum, the story of the Washington conference would remain to be written. This much, American prestige in Eastern Asia owes to the common-sense and broad-mindedness of Leonard Wood.

Aside altogether from the purely local aspects of Filipino reconstruction and politics, the presence of Wood in the Orient for the next three years is essential to the proper safe-guarding of national prestige. The Far East is in a state of ferment. China is chaotic, on the verge of breaking up through domestic strife. No one can foretell the immediate future. Foreign intervention may become necessary as a result of the complete breakdown of government in China. The Bolsheviki may grow bolder and swarm down from Urga, where it is admitted they have a force of 6,000 with another 50,000 stationed along the Mongolian borders. Against her wishes, Japan may be compelled to take action to protect her vital interests. The old order in Japan is gradually giving way before the advance of liberalism. Material changes may be expected in that capable country.

The centre of American power and influence in the Far East will remain in Manila and we must keep ourselves prepared to face any sudden change in the general Asiatic situation. It is vitally essential at this time, that we have a strong man in command in the Philippines, one who has the confidence and support of all parties

at home in the carrying out of American policies. The one man who has such a thorough grasp on the situation and who has already done so much towards rehabilitating American prestige in the islands and throughout the Orient, should remain at his post, prepared to meet any emergency that may arise. Americans in China need Wood in Manila fully as much as he is needed by those whose interests are more intimately interwoven with his immediate duties.

Already he has brought the islands back to a stable financial basis by rehabilitating the currency system and paring down the budget expenses. The oligarchy which dominated insular politics has been overthrown, the judiciary has been reformed, an efficient civil service established and public works pushed forward. Sanitation, hygiene and agriculture have been given a larger measure of official support and harbor works extended. Much has been accomplished. Much more remains to be done. The work of years was destroyed in a wave of sentiment, and it will take years to recover lost ground and restore to the islands the material prosperity and political stability that marked the close of the first era of American unselfishness in the rule of an alien people. From all angles Americans need Leonard Wood where he now is. The nation is to be congratulated that he is to remain to finish his task, until the time is ripe for his successor to take over and carry out his policies. When that time arrives, the situation will still demand a man of Wood's type to maintain the high standard he has set.

Pan-Pacific Conference

A REMARKABLE gathering is scheduled to be held in the centre of the Pacific Ocean this fall.

From October 25th to November 8th in Honolulu the "key men," in matters of commerce and finance, from the lands bordering the greatest of waters are to meet each other daily to formulate plans for future interracial co-operation in bringing about the development of those interests common to all the peoples of the Pacific area. .

These men representing government departments or commercial bodies are being carefully selected from each country. They will be guests of the Pan-Pacific union. These delegates will represent the two-thirds of the world's population which is tributary to the shores of the Pacific Ocean. They realize that the Pacific is to be the future theatre of the world's commerce. They know that the traditions of peace that have always prevailed in the Pacific can best be maintained by the leaders of men in all lines of thought and action in Pacific lands meeting together and establishing among themselves a foundation of mutual confidence on which will be built co-operative effort.

Following the precedent established at the other conferences of Pan-Pacific scientists, educators and press men, called by the Pan-Pacific union, it is expected that President Harding will sound the key note of the commercial conference in his message, to be read by the governor of Hawaii at the opening of its sessions. Secretary of Commerce Herbert Hoover has already penned his message and is sending unofficial delegates as are the departments of agriculture, navy and interior in the United States, as well as the department of trade and commerce in Canada and the proper governmental departments in the other countries of the Pacific. Besides these delegates from governmental departments the U.S. chamber of commerce has appointed five delegates. It is understood that the president and secretary of the national foreign trade commerce will attend with a proper delegation from that body; the presidents of the Pacific coast city chambers of commerce propose attending with delegations composed of leading business men, while from Australia, New Zealand, China, Japan and other Pacific lands, financial organizations or boards of trade will send their leaders.

The presidents and premiers of Pacific lands are heads of the Pan-Pacific union, which, although an unofficial body, is supported in part by appropriations from Pacific governments. The state department has transmitted the invitation of the union to the Pacific governments to send their delegates and it is expected at this conference in Honolulu that a firm foundation will be laid for future friendly commercial understanding in the Pacific area.

An interesting feature of the conference will be the presence and participation on the part of the deans of a number of commercial colleges connected with Pacific universities—this at the request of Japan. It is said that throughout Pacific lands, including the United States, a full million men have taken or are taking foreign trade study courses. These men will guide the future commerce of the Pacific area, and their co-operation is desired by the commercial conference. Viscount Shibuzawa is organizing the Japanese delegation, and Hawkling Yen, one of the delegates to the Washington conference, with H. Y. Moh of the Shanghai chamber of commerce, the Chinese delegation. Manila and even far off Java on the edge of the Pacific expect to send their delegations, and Siberia has already appointed hers.

Alexander Hume Ford, director of the Pan-Pacific union, has made a tour of the United States and Canada in the interests of the conference and is now meeting in their home cities those who will attend from the Orient. Percy Hunter, one of the Australian founders of the union, has made a trip from London to Hawaii and back to Australia to interest that country in sending a representative delegation.

The delegates from the Pacific lands will be entertained in Hawaii for two weeks. Here they will be together all of the time and as all of the delegates will speak English, it is expected that many lasting international friendships will be brought about.

The American, Canadian and Latin delegates will sail from San Francisco on October 18th.

The chief topics to be discussed at the conference are communication and transportation, development and conservation of natural resources, finance and investments, inter-nation relations in the Pan-Pacific area.

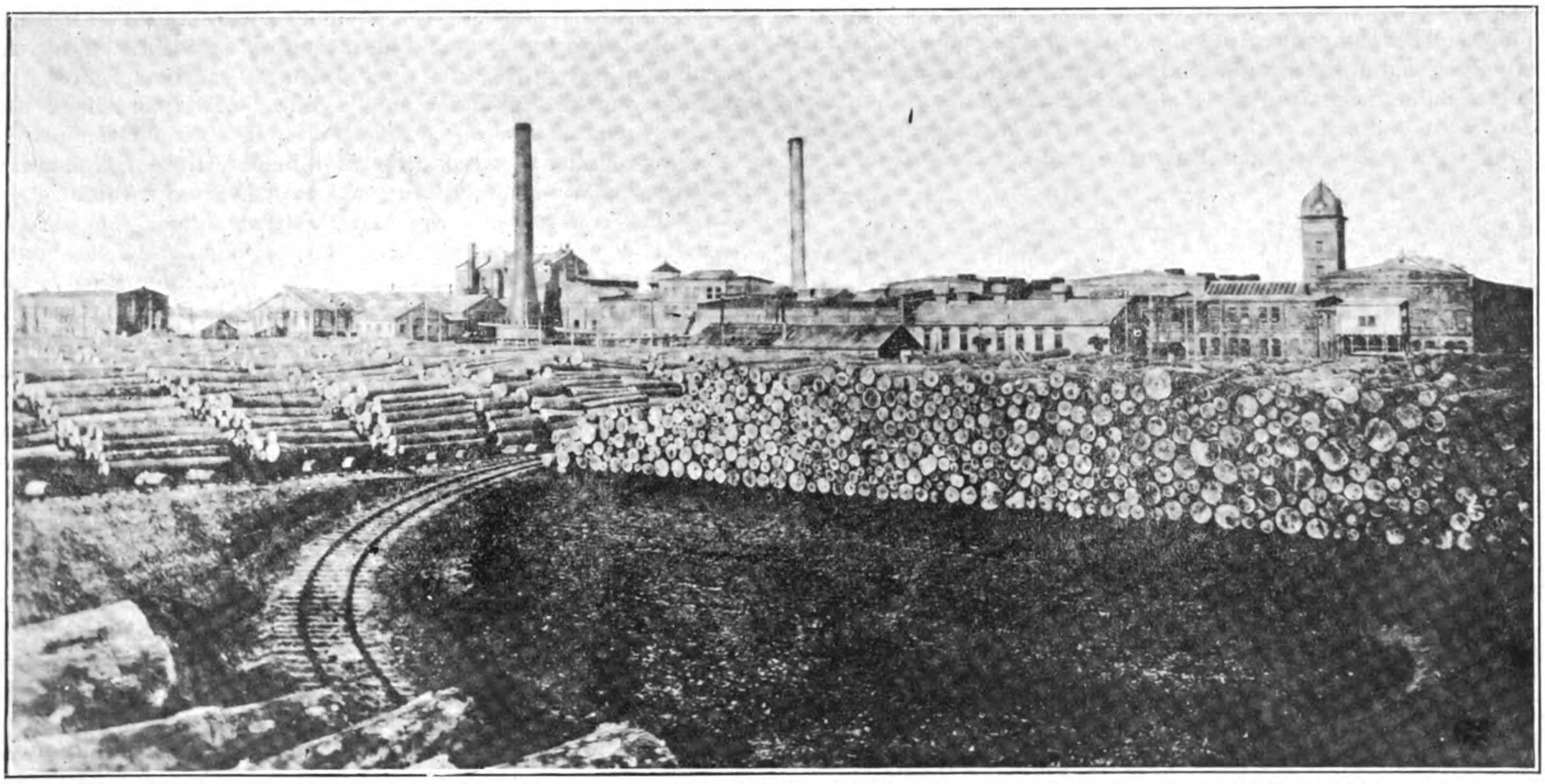
Four cabinet members and many men of highest standing in Pacific lands are preparing papers on these topics and it is expected that more than a hundred of the "key men" of the Pacific will attend the conference to further trade and commerce between Pacific lands.

Fuller will Build Dairen Hospital

THE contract for the design and construction of the Mantetsu General Hospital at Dairen, Manchuria, has been granted to the George A. Fuller Company of the Orient by the South Manchurian Railway Company. The hospital is to cost approximately Y.3,000,000 and its construction will require about two years.

The most serious problem faced in the construction of large buildings in Manchuria is the extreme cold winter weather, which prevents heavy construction during about half the year. The Fuller company has had considerable experience in putting up concrete and steel buildings in Canada, where construction has gone on when the mercury reached the extreme point of 40 degrees below zero, according to Mr. James Lee Kauffman, managing director of the branch company here, and with this experience it will inaugurate winter construction in Manchuria, where the temperature reaches that low mark.

Mr. H. A. Harris, managing director of the company, left for New York last Thursday to select the directing personnel for the work to be done in Dairen. Architects and structural and mechanical engineers will come at once to the Orient; to be followed by superintendents and foreign foremen. A staff of 16 or more foreigners will direct the construction and about 800 native laborers will be employed.



Oji Paper Company's New Mill at Tomakomai, Hokkaido, where 85,000 tons of news print paper is produced annually

The Development of a Great Industry

The Story of the Oji and Fuji Paper Companies

Oji Paper Manufacturing Co., Ltd.

IN 1872, the bureau of bank notes of the department of finance began to print bonds, notes and postage stamps, and a special printing section of the bureau was established. In order to supply the increased demand for foreign paper, the bank note bureau suggested to several private capitalists the advisability of building a factory for this purpose. As a result of this invitation, Jiroemon Mitsui, Saisaburo Shibusawa, Zenemon Ono, Hachiroemon Shimada, Junzo Saito, Risuke Minomura and Ichibei Furukawa promoted and organized the Shoshi Paper Manufacturing Co. in February, 1873, with a capital of Y.150,000. This was the parent of the present Oji Paper Manufacturing Co., Ltd.

In September 1874, construction of a mill at Oji village on the outskirts of Tokyo city, was begun under the direction of an English mechanical engineer, and an American paper expert. In December' 1874, the capital was increased to Y.250,000, and by June, 1875, the Oji factory was completed, and commenced operations in August. In April, 1876, the factory was honored by an inspection by H.M. the Emperor Mutsuhito (the late Emperor Meiji) the empress, and the empress-dowager.

In the meantime, a branch office had been opened in Yokohama, where a general printing business was carried one and later a similar establishment was opened in Tokyo, in order to consume the output of the mill. About 1878 or 1879 the circulation of newspapers and other periodicals became so great that the company discontinued its printing business, and engaged exclusively in the manufacture of paper.

From 1885 and 1886 the demand for all sorts of publications far outran the supply of paper. The Oji Company increased its capital to Y.500,000 in March, 1887, and a second mill was built at Oji. At the same time a small mill was constructed in Shidzuoka prefecture, where low-grade foreign paper was manufactured from pulp produced in the district. With the enactment of the new company laws, the company changed its name to the Oji Seishi K.K.

The Sino-Japanese war which stimulated the growth of newspapers in Japan, resulted in a rapid expansion of the paper industry. The Oji Company increased its capital to Y.1,100,000 in February, 1896, to Y.1,650,000 in April, 1897, and to Y.2,000,000 in November, 1899. A large spruce and hemlock forest owned by four villages in Shimo Ina-gun, Nagano prefecture, was then acquired and a new mill built at Nakabe, Sakuma Mura, Iwata-gun, Shizuoka prefecture. Since January, 1899, the company has devoted its whole capacity to the production of printing paper.

Later in the year, however, it was found that the company had over-extended its operations, and it became necessary to reduce the capital from Y.2,000,000 to Y.500,000. Since then its business has steadily prospered. For the past five years dividends at the rate of 25 per cent. per annum have been regularly paid the shareholders, and in addition to Y.10,450,000 set aside as reserve, more than Y.11,000,000 has been written off for depreciation since 1912.

With the demand for news during the Russo-Japanese war, the domestic mills were unable to meet the paper requirements, and the Oji Company increased its capital to Y.6,000,000, and erected a large mill at Tomakomai-machi, Yufutsu-gun, Iburi province, Hokkaido.

This mill is operated by hydro-electric power which the company generates from the waters of Shikotsu lake, which never freezes in winter, nor dries up in summer, like many lakes in the Hokkaido. The timber supplies are purchased from the imperial household forests, and the government reserves. The mill is considered to be the finest in the Orient, from the point of quantity of production and supply of materials.

Since the Tomakomai mill started operations, the imports of foreign newsprint have been greatly reduced. The greater part of the

paper used by newspapers in Japan is now supplied from this factory. The company prides itself on the fact that H.M. the Emperor Yoshihito inspected the Tomakomai mill when he visited the Hokkaido in September 1911.

Pulp Manufacture

In July, 1914, the Oji Company doubled its capital, purchased the Mitsui pulp mill in Karafuto and changed its name to Otomari Kojo, in order to manufacture chemical pulp and eliminate its importation. With the outbreak of the European War imports of pulp were greatly hampered by the difficulties of transportation. The demand, however, increased tremendously, and a new factory was built in Toyohara-machi, Karafuto, in December, 1915, and called the Toyohara Kojo. The Imperial Paper Manufacturing Company's mill in Osaka was purchased in February, 1916, and renamed the Osaka factory of the Oji Company. In June of the same year the paper manufacturing plants of the government printing office were purchased and renamed the Jujo Kojo.

In May, 1918, the capital was increased to Y.25,000,000. In December, 1917, a subsidiary company called the Chosen Paper Manufacturing Company was organized with a capital of Y.5,000,000 at Madendo, Kojomen Gishu-gun, Heian Hokudo, Korea, to manufacture sulphate pulp, using timber from the Yalu river zone. It is the pioneer in this industry in Korea.

In order to separate the pulp from the paper manufacturing end of the business, the pulp mills of the Oji Paper Manufacturing Company were turned over to the Karafuto Industrial Company, Limited, in July, 1918, and capitalized at Y.5,000,000. This company's head office is in Otomari-machi, Karafuto. In the same month, the Oji Paper Company bought up the shares of the Yukosha Kabushiki Kaisha, which with a capital of Y.2,000,000 was engaged in the manufacture of printing paper at Kameido, in Tokyo prefecture.

In October, 1920, the capital was increased to Y.50,000,000, and in December of the same year took over the business of the Hokkai Industrial Company, capitalized at Y.500,000, with its main office and factory in Fushiki-machi, Toyama prefecture. It manufactures ground pulp and printing paper.

A change of policy was made in May 1921, and in August the business of the Karafuto Industrial Company, Limited, was purchased, and in December the Chosen Paper Manufacturing Company was taken over by the main company, and its capital increased to Y.51,000,000. The two factories are now called the Karafuto Bunkojo and Chosen Bunkojo.

During 50 years or since the company was organized, its capital was increased from Y.150,000 to Y.51,000,000, of which Y.31,500,000 is paid up. It is the largest paper manufacturing company in Japan, and also one of world-wide importance.

The officers of this company are: President and Special Managing Director: Ginjiro Fujiwara; Managing Directors: K. Takashima, N. Takata, K. Ogasawara; Directors: S. Ohashi, N. Ariga, K. Hayashi, J. Horikoshi, K. Inoue, T. Adachi and J. Tanaka; Auditors: S. Nakai, H. Nishimura, Y. Hirose and K. Iida.

The important enterprises of this company and their equipment are given below:

OJI MILL: Situated at Ojimachi, Kita Toyoshima-gun, Tokyo prefecture.

No. 1. Mill, opened, August, 1875; No. 2 Mill, March, 1880; No. 3 Mill, September 1817.

Site: 11,047 *tsubo* (36 sq. ft). Brick buildings, one and three stories.

Paper Machines: Two 98-in and one 84-in. Fourdrinier machines. *Power*: Electric, 1,200 H.P.; Steam, 450 H.P.

Raw Materials: Rags, rice straw, pulp, produced by their own mills and imported. *Products*: Hook paper: *Annual Production*: 24,000,000 pounds.

JUJO MILL: Situated at Jujo, Oji-machi, Kita Toyoshima-gun, Tokyo prefecture.

Site: 48,377 *tsubo*. Brick buildings, one and two storied.

Paper Machines: One 100-in. and three 84-in. Fourdrinier machines. *Power*: Electric power, 1,340 H.P.; Steam, 740 H.P.

Raw Materials: Same as Oji Mill. *Products*: Book and post-card paper. *Annual Production*: 48,000,000 pounds.

OSAKA MILL: Situated at Zengenji-machi, Kita-ku, Osaka city.

Opened: November, 1914; purchased, February, 1916.

Site: 23,155 *tsubo*. Brick and wooden buildings, one and two storied.

Paper Machines: One 86-in. and two 74-in. Fourdrinier; One 96-in. and two 72-in. cylinder. *Power*: Electric, 2,732 H.P.; Steam, 345 H.P. *Product*: Book paper, cigarette paper, celluloid paper. *Annual Production*: 20,000-lbs.

KETA MILL: Situated at Keta, Keta-mura, Shuchi-gun, Shizuoka prefecture.

Opened: December, 1889.

Site: 16,968 *tsubo*. Brick and wooden buildings of one, two and three stories.

Paper Machines: One 78-in. Fourdrinier; one 72-in. cylinder. *Power*: Hydro-electric power, 488 H.P.

Raw Material: Spruce and a species of Hemlock known in Japanese as Toga: *Product*: Wrapping paper, match paper, etc. *Annual Output*: 7,000,000-lbs.

This mill also operates ground wood and sulphite mills producing pulp required by the paper mill.

NAKABE MILL: Situated at Sakuma-mura, Iwata-gun, Shizuoka prefecture.

Opened, January, 1899.

Paper Machines: One 88-in. Fourdrinier; one 72-in. cylinder. *Power*: Two steam engines, 35 H.P.; 6 turbine water wheels, 1,389 H.P. *Product*: Book paper, wrapping paper, etc. *Annual Output*: 9,000,000-lbs.

There are ground wood and sulphite mills manufacturing pulp required by the paper mill.

TOMAKOMAI MILL: Situated at Tomakomai-machi, Yufutsu-gun, Hokkaido.

Opened: September, 1910.

Paper Machines: Four 142-in., two 100-in. and two 98-in. Fourdrinier: *Power*: 16 steam engines, 2,880 H.P.; 3 water turbines, 1,210 H.P.; 4 Pelton water wheels, 1,800 H.P.; also uses electric power generated by other companies; operating 102 motors, 2,521 H.P.

Product: News print paper and wrapping paper. *Annual Output*: 150,000,000 pounds.

Attached to the paper mill, there is a large and up-to-date plants manufacturing the necessary quantity of ground wood and sulphite pulp.

SULPHITE PULP MILLS: The company operates three sulphite mills in Karafuto (Japanese Saghalien). Easy bleaching sulphite is turned out by these plants, comparing favorably with products of any first-class Scandinavian mill. The THREE STAR BRAND is well known in Japan and abroad.

ODOMARI MILL: Situated at Odomari-machi, Karafuto. *Product*: Easy bleaching sulphite pulp. *Annual Output*: 10,000 tons.

TOYOHARA MILL: Situated at Toyohara-machi, Karafuto. *Product*: Easy bleaching sulphite pulp. *Annual Output*: 20,000 tons. Wrapping paper. *Annual Output*: 6,000,000 pounds.

NODASAM MILL: Situated at Odasam-mura, Karafuto. *Product*: Easy bleaching sulphite pulp. *Annual Output*: 10,000 tons.

HYDRO-ELECTRIC ENTERPRISES: The Oji Paper Manufacturing Co., Ltd., also owns and operates five power stations generating 38,000 H.P. Power required by the paper and pulp mills at Tomakomai is supplied at low cost by these plants and what is left over is sold to different concerns for manufacturing and lighting purposes.

SUBSIDIARY COMPANIES: There are two subsidiary companies, whose operations are controlled by the Oji Paper Manufacturing Co.

KABUSHIKI KAISHA YUKOSHA, TOKYO: *Paper Machine*: One 60-in. Fourdrinier. *Product*: Book paper. *Annual Output*: 3,000,000 pounds.

HOKKAI KOGYO KABUSHIKI KAISHA, FUSHIKI: *Paper Machine*: One 100-in. Fourdrinier. *Product*: News print paper. *Annual Output*: 12,000,000 pounds.

The general office of the Oji Seishi Kabushiki Kaisha is at No. 9 Shinsaiwaicho, Shiba-ku, Tokyo.

Fuji Paper Manufacturing Co., Ltd.

The Fuji Paper Manufacturing Company was promoted in 1881 and on the advice of an influential government engineer it was decided to build a factory at the foot of Mt. Fuji where water supply and communications were good. This plan, however, had to be given up because of the financial depression due to the fall in the value of bank notes.

Shortly after this Ichiro Murata, one of the promoters, went to America to study the paper industry, and in August, 1887, returned to Japan and was able to interest the late Zensaburo Yasuda in his project. The Fuji Paper Manufacturing Company established in November, with a capital of Y.250,000, was the result. A building was constructed at No. 1 Itchome, Sanjikkenbori, Kyobashi-ku, Tokyo. It still remains the main office of the company. During the years of its operation the capital of the company has been increased eleven times, as shown in the following table :—

November, 1887	Y.250,000
May, 1889	500,000
January, 1891	1,000,000
January, 1894	1,500,000
July, 1897	2,300,000
April, 1906	4,600,000
December, 1906	10,000,000
November, 1916	15,000,000
February, 1917	21,000,000
March, 1919	24,100,000
December, 1919	35,150,000
June, 1922	37,550,000

The last capital increase in June, 1922, was made as the result of a merge with the Chemical Pulp Company, Limited, by which the Ochiai Factory in Karafuto came into possession of the Fuji Company.

The original Fuji factory was completed in 1889 and all kinds of paper manufactured. In 1897, the second mill was completed and placed in operation, and shortly after the Hokkaido Pulp Manufacturing Company was purchased and called the No. 4 factory. The business was so carefully directed that in 1891 the imperial household became one of the large shareholders in the company.

In 1908, after Mr. K. Ono became president, a mill was completed at Yebetsu in Hokkaido, and in November, 1915, the Shimoda Paper Manufacturing Works in Hyogo prefecture was purchased and called the Kanzaki Factory. A little while afterwards the Asahigawa Electric Company in the Hokkaido, was purchased and operated as an independent electric enterprise, supplying power to the company's factories, as well as to the general public. In October, 1917, a new pulp mill was completed at Ikeda in the Hokkaido.

The importance of the pulp industry had become so great by October, 1918, that a new company called the Fuji Pulp Company, Ltd. was organized to take over the Ikeda factory. In May, 1919, the Hokkaido Industrial Company was purchased and its factory called the Kushiro Factory.

At the present time the Fuji Paper Manufacturing Company owns the following mills :—

Fuji No. 1 Factory	Shizuoka Prefecture.
" " 2 "	"
" " 3 "	"
Shibakawa Factory	"
Kanzaki Factory	Hyogo Prefecture
Senju "	Tokyo Prefecture
Ebetsu "	Hokkaido
Kanayama "	"
Kushiro "	"
Ochiai "	"

Besides these, the Edogawa factory which has been under construction is nearly finished; the factory will be opened to business before long.

The officers are: President and Director: Heisaburo Okawa; Special Managing Director: Yohichi Anamizu; Managing Director: T. Takahashi; Directors: K. Suhara, K. Ono, E. Tanaka, K. Kumazawa, R. Ono and U. Tsukagoshi; Auditors: H. Sato, K. Koike and S. Wakao.

Machine Tools in Chinese Shops

By Sam Dean, Peking, China

MANY Americans do not know that there are in China several Chinese companies which make good gap lathes, drill presses and planers for rough work, and make them so cheaply that they supply practically all the repair shops of the country. Only the larger shops such as the railway shops have foreign tools, and these are mostly equipped with English machines.

There is a large and increasing demand in China for machine tools of the repair shop type, but the Chinese have to be educated to the fact that one good foreign tool is worth several cheap Chinese made machines. Perhaps the most popular American machine tool here is the lathe. This is rather too light for the work it is made to do, but accuracy doesn't matter on the jobs put through in most cases so it does fairly well.

The expensive machines with gear boxes, electric drives and all that are quite outside the present demand and pocket book. Now and then a large mill will buy good machine tools, but there are comparatively few such mills. However, every city now has an increasing number of small machine shops and this is the trade which has volume and now uses Chinese and Japanese goods. These shops are run in many cases by graduates of Chinese technical schools and Chinese technical schools are mostly equipped with Chinese or Japanese, or at most English made or German, made tools. Naturally the students buy for their own shops what they have learned to use. Also the schools with their small incomes buy the cheapest machines.

Personally, I feel that there are two lines which American machine tool manufacturers could follow in order to get the Chinese market. One is to put their tools in technical schools out here at prices that would enable them to be bought, rather than shoddy Japanese or Chinese machines. The other is to find out the companies that are supplying the Chinese repair shops with machines and in these shops at least work hard to put in American machines. I doubt very much whether we can compete with the Chinese made machine for the makeshift repair shop, but we certainly ought to be able to furnish the machines that make China's machine tools.—*American Machinist.*

Menace to Travel in Manchuria

Train Wrecking as a Pastime or a Policy?

BENEATH the sedate exterior of the South Manchuria Railway, an important link of the world's highway of travel, there lurks a treacherous demon, looking for a chance to tamper with the railway traffic to the serious menace of life and property, says a recent official report on the wreck of the south-bound express.

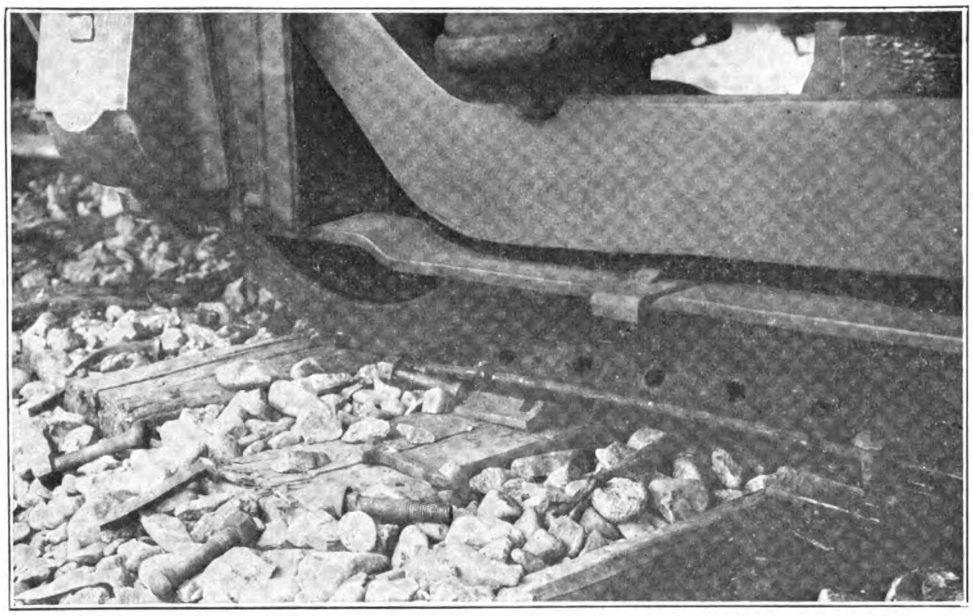
This is highly regrettable, but, with all the efforts of the railway authorities, the hopes of the traveling public to eliminate these menaces may be slow to be fulfilled.

In fact, interferences with the South Manchuria Railway traffic have been attempted with annoying frequency, but such attempts have in most cases been frustrated through the joint co-operation of the railway people, the police and the Japanese railway guard.

None of the dastardly plots to interfere with the railway traffic has been so ingenious in conception and in execution as the fatal train wrecking that occurred between Mukden and Wenkuantun, a wayside station just north of Mukden, on August 14th, 1922.

The wreckers went about their business that time with a scientific dexterity.

It is significant that robbery was plainly not the object of the wreckers, for no passengers were molested, though the first and second-class coaches were brought to a standstill in a lonely district in the pitch dark of late night.



All the six bolts of the fish-plate, together with all the spikes for half a rail length were found removed and the bolts on the next fish-plate loosened

How the Wreck Took Place

The south-bound express train leaving Changchun at 5 p.m. on August 14th and due at Mukden at 11.20 p.m. passed Wenkuantun station at the scheduled hour and was rounding a gentle curve at 407.650 kilometres north of Dairen, when, with a strange sound, the train shot sideways about 70 metres ; the locomotive with two third-class passenger cars were overturned ; the dining car, together with two first and second-class cars, were also derailed, but were only tilted.

The Japanese stoker was burnt all over the body by the hot water of the boiler and was killed on the spot ; the Japanese driver got burnt in both legs and face and died in hospital ; the Chinese help was also burnt sustaining light injury ; in addition, one of the dining car attendants and two of the passengers were slightly injured.

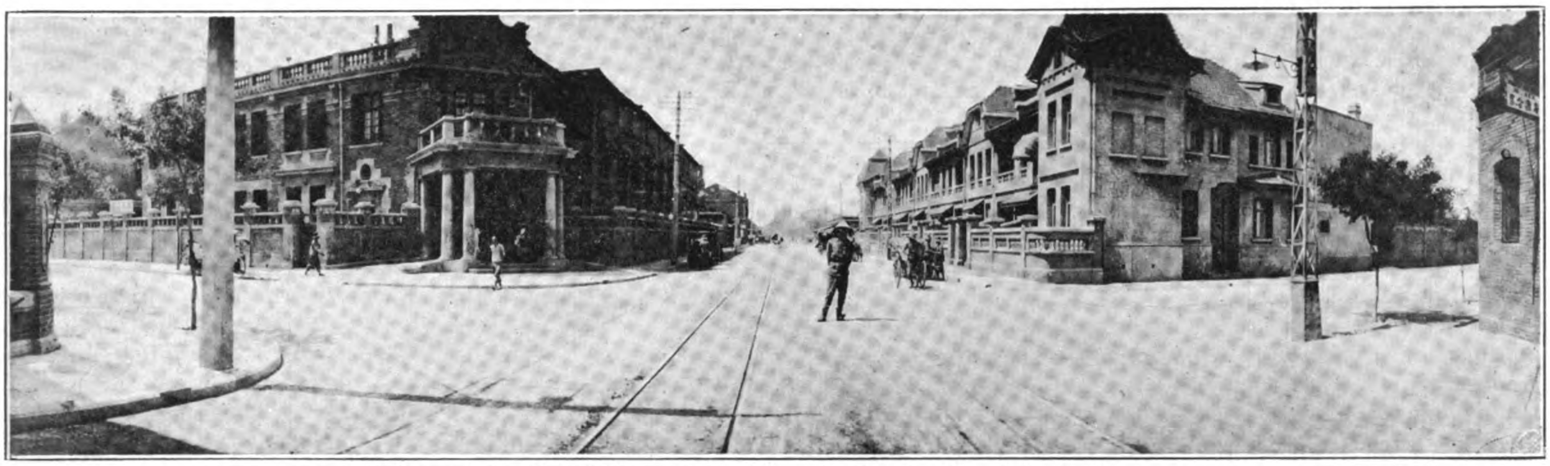
That the two sleeping cars and the mail car attached to the train escaped scot free, and that the injuries to the passengers were only nominal were owing to the Japanese driver's caution in his knowledge that that particular section is exposed to interferences by mischief makers. No sooner than his car caught the strange sound, he at once brought the emergency brake to play. But for his presence of mind and loyalty to his duty, the consequences to the passengers would have been too terrible to contemplate, especially as the train was then running at the speed of forty miles an hour.

There has never been a shadow of doubt as to the object of the train wreckers. Their sole aim lay in interfering with the train traffic. The point, at which the wreckage took place, was in a curve. All the six bolts of the outside rail, together with all the spikes for about half the rail, had been found removed. Besides, all the bolts for the adjoining splice, too, were found loosened.

The fact that the outer rails in the bend were chosen, coupled with the fact that the work was done in the space of forty minutes between the time of the last patrols going their regular nocturnal round and the time of the express train to pass the point, indicate that such a feat could not be accomplished by a group of men not fewer than ten, equipped with some amount of technical knowledge and experience.

Instances of interference with the track and theft of accessories on the South Manchuria Railway lines have been many, especially about Mukden, as may be shown in the list.

1922. January 5, Hunho-Mukden, 395-396 kilometres from Dairen, 2 pieces of telegraphic copper wires (80 metres) stolen ; January 17, at km. 394, 100 metres of wires stolen ; February 10, kms. 405, spikes driven into the space between rails at the joint ; March 7, km. 403, a stone weighing about 42-lbs. laid on the track ; March 28, km. 403, come thirty small-sized stones laid on the track ; April 5, km. 405, while a detail of railway patrols was on one of their rounds, they noticed three Chinese soldiers and two Chinese coolies placing a couple of stones weighing 25-lbs. or so. The coolies were captured and the Chinese soldiers were called upon to explain. They were going to be taken to the guards' box when about 70 or 80 Chinese soldiers gathered and attacked the Japanese soldiers and went away. April 14, km. 400, about 30 small stones were placed on the rail track. April 16, near km. 400, about 15 small stones laid on the rail ; July 17, near km. 406 (between Mukden and Wenkuantun), small rocks laid on the rail; July 18, near km. 404, small rocks laid on the rail and some Chinese soldiers were noticed looking on. August 2, near km. 395 (between Mukden and Hunho), 36 kilogrammes of telegraphic copper wire stolen ; August 14, km. 407, train derailed with fatal results as above stated. August 23, km. 400 (at level crossing), as train No. 44 was in motion, a stone of the size of a man's fist was thrown at the train by one of a group of seven or eight Chinese, the window pane of the caboose car was smashed, and the conductor injured.



A Street in the French Concession at Tientsin; Russian Church in the distance

Tientsin's Native Industries

The Turning Point of Chinese Industry

By O. D. Rasmussen

WORLD economics of the past four years, the rise and fall of silver, the piece goods crisis, the attempted boycott of Japanese goods by Chinese in 1919 and 1920, and kindred polito-commercial difficulties, have served to effectively bring home to the Chinese their dependency on foreign supply for the satisfaction of their daily needs.

The realization of this unsatisfactory state of affairs, and its utilization in bringing about a new outlook towards native economics may be said to have formed a turning point in the history of Chinese industry. The failure, either by lack of materials or by excessive prices, of European and American sources of supply, because of disturbed financial and labor conditions, has revealed to the Chinese, forced to fall back on their own resources, how inadequate their own industries have been to meet the requirements, in quality, quantity and design, of the home demand.

Chinese manufacturers, financiers and business men, aware of the opportunity of wealth in the productive field of native manufacturing, lost little time in translating it to action. Now one sees on every hand indications of increasing volume of native manufactured goods, of old factories regenerating and of enlargements, extensions and of a general industrial expansion. The native and a few foreign stores now stock such diverse manufactures as silk stockings, dolls and tennis rackets, cigarettes, soap, matches and electric fittings, manufactured by Chinese factories by entirely native supervision, materials and labor.

The executive and constuctive brains of the country are now concentrated, not upon the age-long effort to amass money and increase private riches from existing wealth, but upon the production of new wealth from the manufacture of goods to meet wants arising out of the rapidly rising standard of living.

The study of native industry is encouraging. It refutes the argument that Chinese are not capable of organizing and administering an efficient business institution. Of the few factories brought under observation, there are signs that their organization has to contend with unnecessary depreciation of machinery, through lack of intelligent operation by workmen, but apart from this, which will be taken care of by the growth of a skilled and educated mechanical class, there are no indications that Chinese manufactures are not destined to reach a high standard in the world's products.

At the time of writing the government bureau of economic information announces that the ministry of agriculture and commerce has circularised the provincial industrial commissioners that it has decided to issue certificates of merit to Chinese manufacturers on conditions that their product must be : (1) a new invention, (2) manufactured from native raw material, and (3) of a quality similar to that of foreign importation. This is obviously a step in the right direction and shows quite distinctly what the Chinese have for their goal.

As regards the position between capital and labor there is not the same encouraging outlook. The situation claims much more treatment than can be given under this head, but it will suffice in this connection to refer to general conditions as they reflect upon the native industries.

Advance in the status and environment of laborers has not kept pace with the development of machinery. In fact, in the main, it might be said that no advance whatever has been made in the large majority of factories. Hours, wages and surroundings are still on the primitive native basis. They form the nucleus of a future struggle between capital and labor, and are identical with conditions fifty years ago in foreign countries, where the conflict is now at its height.

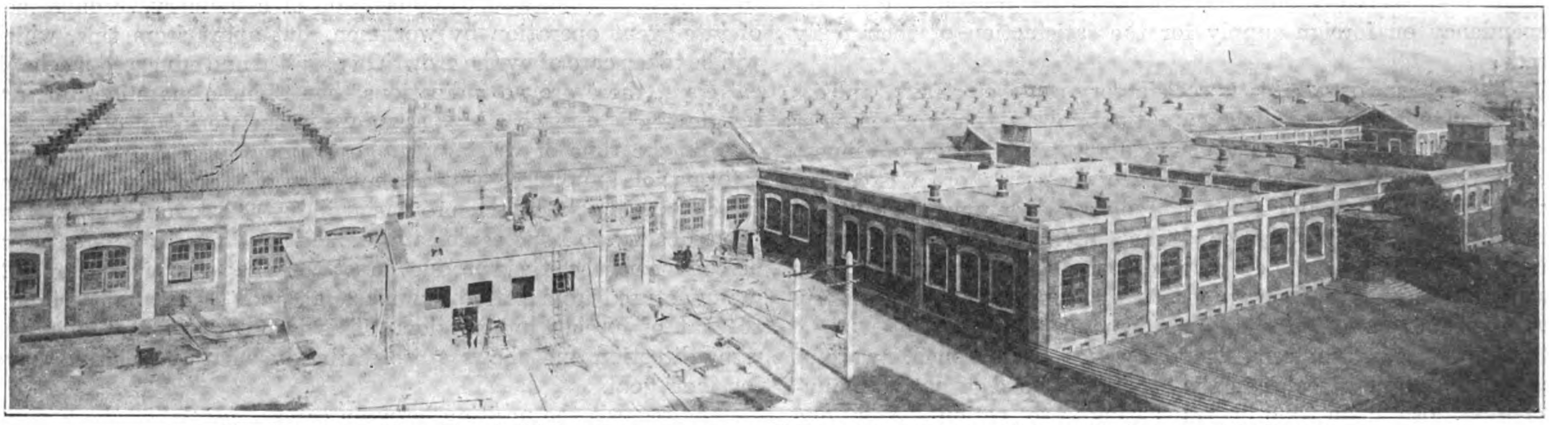
Handsome new Buildings in Tientsin; Office of Fearon, Daniel & Co. at Right

While manifestations of unrest are not apparent in these native factories, there still exist the factors which form the roots of trouble, factors which, when seized upon by propagandists of the type of bolshevist now strongly entrenched in Shanghai and Peking, are capable of unlimited magnification.

The Chinese capitalists, if we can class them as such, are not conscious of exploiting human labor, as foreign lands have come to recognize it. They hire and accommodate laborers after the custom and fashion peculiar to each individual craft, with no particular reservations or limitations not common to all engaged in that trade. Standards of living and factors which bear upon them are not the same in all parts of the country. In Shanghai the price of rice is most important, whereas in Tientsin and neighborhood rice is not the principal staple, and its fluctuations make scarcely any appreciable difference in the cost of food.

Raw Cotton for the Busy Mills at Tientsin

But while not committing intentional exploitation, nevertheless the Chinese, and the foreign employer as well, are omitting efforts to ameliorate the conditions. A large problem of economics surrounds this question, but reduced to simple terms it means that the onus of raising the standard of living is on the employers. It rests upon their initiative to raise the selling price, reduce profits to a fair minimum and keep wages on a fair living scale. It is easy to write it, we are aware, but, sooner or later, the problem has to be faced, and it cannot be too soon to keep pace with swiftly moving events.



The New Heng Yuen Textile Mill at Tientsin, equipped by Andersen, Meyer & Co. with American Machinery

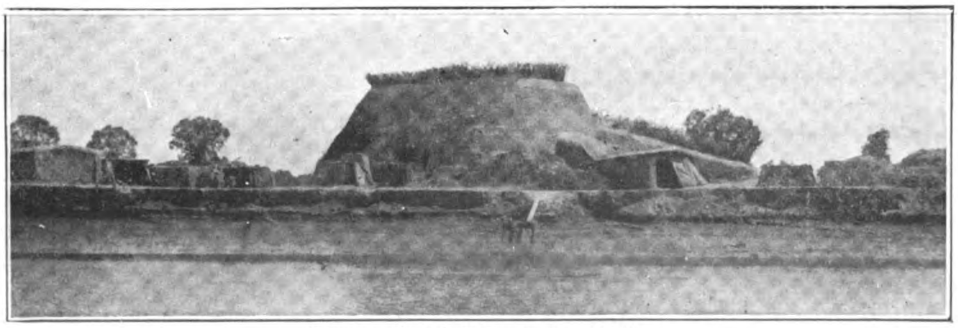
Chinese labor conditions are low, but they have been on a par with the Chinese living costs. They can move only in one direction and that is upwards. Intelligent anticipation will avert catastrophes, which the kindergarten industry of China cannot well afford to meet, and intelligent foresight can come only from those prepared and able by virtue of education and wealth to exercise it. If employers wait for labor to extort what they feel to be a reasonable portion of capital to pursue their right to happiness, the toll will be higher.

China needs, almost above anything else at the present time, a bureau of labor, the duties of which should be to collect and analyse statistics of conditions facing both workmen and employers. It should be able, among other things, to form commissions of inquiry into current disputes and be at the service of all *bonâ fide* inquirers, for a nominal fee, in connection with growing problems. Out of its findings and experience might come the nucleus of comprehensive labor legislation, concerning hours, wages, child and woman labor, factory conditions, hygiene, sanitation and allied conditions.

Cotton Yarn

THE YU YUAN FANG CHIH KUNG SSU, located just outside the ex-German concession at Hsiao Liu Chuang, was established in 1916 and commenced work in March, 1918. It originally was part Japanese but now it is said to be entirely Chinese owned, and is capitalised at $3,500,000 Chinese currency, the estimated cost of present buildings and plant being about $3,000,000. The machinery is entirely American (Saco-Lowell) purchased through Andersen, Meyer & Company. The mill runs 50,000 spindles with 50,000 more to be added next year. Just at present 25,000 spindles are working day and night with an average output of 24,000 pounds per 24 hours, single thread, 16s. and 20s. The raw cotton used is entirely native which, because of the shortness of fibre and coarseness, produces a hard thread.

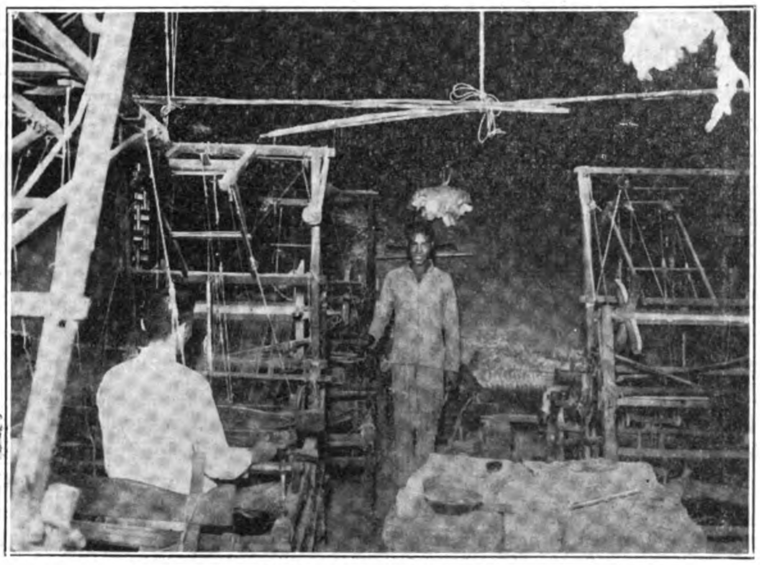
The factory employs about 1,400 hands of whom 1,000 are boys between the ages of 13 and 17 years. There are two shifts of 11½ hours each; no Sunday work. The average boy's wage is 20 cents a day, and a man's wage averages about 40 cents. The chief engineer is Japanese. Practically no women are employed as Tientsin women are inexperienced and feel mill work to be a disgrace. Good housing is furnished for those who wish it in the Chinese village in an enclosed compound outside the mill. A doctor is on the regular staff, and a small hospital has been erected. This mill is modern in every respect, and factory conditions under which



Chinese Brick Kiln on the Hai-ho

the laborer works as a whole are good in the matter of sanitation and light.

THE HUA HSING FANG CHIH KUNG SSU was erected in North Tientsin (Ho Pei) in 1917-1918 and commenced operations in January, 1919. It is equipped with 25,000 spindles (Saco-Lowell) through Andersen, Meyer & Company and produces yarn from 10s. to 20s. similar to that of the Yu Yuan Textile Company. The average output is 25,000 pounds per day. The mill employs about 1,600 workmen in two shifts of 12 hours each—one change of shift per week. Women employed number about 700 brought from Shanghai. Boys employed number about 200. A statement of wages was not obtainable, but they may safely be estimated at a little more than those paid at the Yu Yuan mill as it was stated that no housing is provided. The mill contemplates installing cloth weaving machinery. Conditions here are not so good as at the Yu Yuan, the mill not even stopping during the meal hours, neither are the buildings as well lighted nor kept as clean.



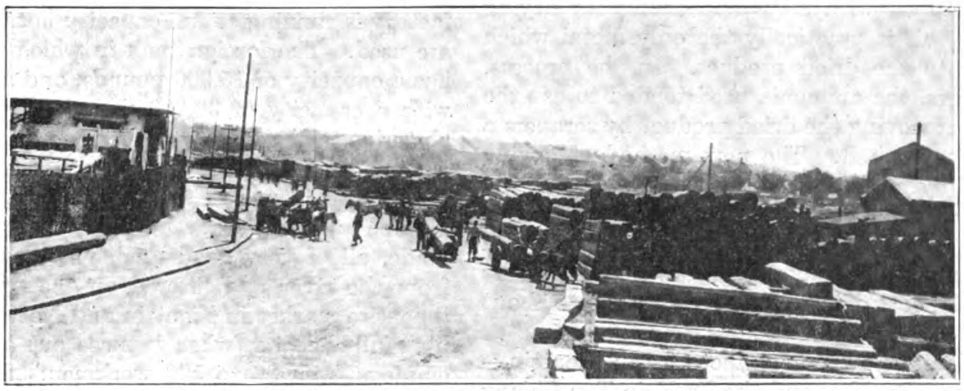
Native Loom, Tientsin

THE HENG YUAN FANG CHIH KUNG SSU, Ho Pei, Tientsin.—Machinery is from the Saco-Lowell shops purchased through Andersen, Meyer & Co. It will manufacture 8s. to 20s. yarn. The capitalization is said to be $3,000,000 and the factory is quite up-to-date in every respect.

Tientsin's Chinese Industries

Cotton Cloth

All cotton cloth weaving establishments in Tientsin are run by man power, and as such they range from one or two looms (native and Japanese make) in a house to 50 or 60 in so called factories with hired labor or apprentices. There are from 100 to 150 such weaving establishments, but none of them are factories in the modern sense. Ho Chia Ho—that small section of the native city between Ku I Chieh and the Yu Ho—is the location of a great number of them, every hutung and lane displaying numerous imposing signs, and the air resounding with the hum of flying shuttles and blatter of looms from small Chinese buildings behind the walls. Most of these factories also call themselves dyeing works, each one dyeing its own cloths and yarns and specializing in its own particular designs and qualities of cloth, although none have a monopoly of a particular style. Many of the products are excellent in coloring, design and quality considering that they are made by man-power looms, and compare very favorably with foreign machine-made products. These native cloths include coarse and fine nankeens dyed in the piece, grey shirting, colored shirtings dyed in the thread, imitation ticking, figured cottons, bed coverings, cloths with crimp designs, drills, canvas selling by weight, mercerized cloths woven from foreign cotton and rhea thread, and brocades with as good a finish as a foreign-made product.



Lumber Yards in the Italian Concession, Tientsin

One of the largest of these establishments is the CHUNG HUA SHIH YEH CHIH JAN KUNG CH'ANG, established seven years ago, capital $ 20,000, with three factories, one for dyeing and two for weaving. These factories are typical Chinese houses, poorly lighted, dirty and with earthen floors. There are 150 workmen employed. Wages are paid by the piece, although in some of the other establishments wages are paid by the day or month, housing and food being included or excluded according to circumstances. In this particular factory an average wage of $0.50 a piece of 21 yards is paid, weavers of plain cloths getting a smaller wage than those weaving fancy cloths. A good workman will weave one piece of ordinary designed cloth a day. Hours of work are not fixed but average 12 per day. A market for this factory's product is found as far south as Shanghai and Nanking.

THE I CHANG FAN PU KUNG SSU specializes in canvas. It was established in 1913, capital $100,000. The factory proper is a large room, Chinese style, well lighted, brick floor, cleaner than the average factory, and efficiently managed, 300 apprentices, most of them boys, are employed with housing and food provided. Wages are paid by the piece in excess of 320 yards per month. The working day is 12 hours. The cotton canvas produced is of good quality.

Match Factories

There are two large Chinese-owned match factories in Tientsin, the TAN HUA HUO TS'AI KUNG SSU and the PEI YANG HUO TS'AI KUNG SSU. The latter was built in 1906 and now operates two factories, the original one on the banks of the Yu Ho and the new one, built in 1914 at Nan Kai. The total number of workmen employed is about 1,350. Of these, about 1,000 are outsiders and 350 live on the premises with food provided. There are 12 hours of work a day; the average wage is 30-50 cents; half-day's holiday on Sundays. Rest hours during the working day are from 8.00-8.30 a.m., 12.00-1.00 at noon, and 4.00-4.15 p.m. A number of women and girls are employed in packing the match boxes. Chemical materials come from abroad; match splints from Japan and Manchuria.

Two grades of matches are made, a first quality which is a safety match, and a second quality which is not a safety match but which is in popular use among the Chinese because of its cheapness—about seven cash per box of about 150 matches. The machines used are Japanese made and are run by

man power. Conditions of labor are dangerous and very unhealthy. The factory is poorly constructed; ventilation to carry off the strong fumes is poorly arranged; and there are few safeguards against fires (matches constantly ignite and the fires are extinguished by small boys with brooms). Most of the workmen are boys and young men.

In spite of bad laboring conditions in the factory itself, the Chinese homes in the vicinity of the mill are an improvement over the average lower class home seen in China and reveal a higher standard of living.

Glass Factories

THE MING CHING PO LI KUNG SSU began operations in August, 1919, in answer to the demand for window panes of non-Japanese manufactures, a great deal of the local demand being met by Japanese products from Shantung. This factory at present has an output of 40 cases per day to be increased later to 60 cases per day, each case containing 100 square feet of window-glass of good quality,—three colors, blue, green and white. Manufacture of other kinds of glassware is not contemplated. The present product is selling at $14 to $16 per case. The factory is poorly constructed—typically Chinese:—there are two work shifts of 10 hours each; no Sunday work; 30 skilled workmen from Shantung; wages $30 to $60 per month.

THE TA HSING LIAO CH'I KUNG SSU began operations in 1912; capital; $6,000 and for some yeaJs produced only lamp chimneys, bottles, globes, etc. In the fall of 1919, it also began to make window glass. There are about 150 workmen employed; of these, the window-glass blowers come from Shantung and command wages of from $10-$50 per month, 10-12 hours work per day, most of them boys, are local men, and work longer hours with wages running from $10-30 per month. Food and housing are provided. Factory conditions are bad. The glassware produced is not of very good quality as compared with a foreign product from America and England, but it is cheaper and better than Japanese-made goods of the same class. In addition to the above factories, there are the Kung Chi Po Li Ch'ang Li, West Tientsin, and the Chung Li Liao Ch'i Ch'ang, established in 1913 at Ho Pei but at present not working. A new window-glass factory, the Pei Yang Po Li Kung Ssu, is just in process of erection at Ho Pei.

Egg Products

YUNG CHI TAN CH'ANG and TA HSIN TAN CH'ANG.—The prepared egg industry in this district was started several years ago and was in a flourishing condition up to 1918 when it was for a time affected by various food laws of several importing countries, particularly America. In 1917, over five million pounds of egg albumen and yolk, dried and moist, were exported from Tientsin, and in 1918, only two million pounds. On the other hand fresh eggs increased in export by five and one half million pieces over that of 1917. The American food laws rule that dried egg products containing more than one hundred milligrams of metal to the kilogram cannot enter the United States; and when the dried egg industry was first promoted in the Far East, at the advice of German firms, all plants were equipped with trays and drums for drying purposes made of zinc as this is practically the only metal which does not impart a color to the dried product. In the process, however, of drying the eggs, the ammonia used tended to eat the zinc pans in spots, and in removing the dried product by scrapers a portion of the metal came with it. The new method of drying eggs was then introduced by means of "spraying" or blowing the egg in fine spray into a heated chamber. The resulting product is free from metal and the various egg plants which are largely in the hands of Chinese are gradually converting their establishments into spray plants, the initial cost of installation amounting to about $15,000.

There are only two Chinese-owned egg factories in Tientsin—the Yung Chi Tan Ch'ang at Pei K'ai and the Ta Hsin Tan Ch'ang at Ho Pei. These factories use both methods and turn out a very good product. The most important Chinese-owned factories are located in the interior—Paotingfu, Shihchiachuang and Honan province.

Asbestos

THE TIEN CHING SHIH MIEN KUNG SUS (Tientsin Asbestos Joint Stock Company, Ltd.) was established in 1915 in the British concession. The factory—a group of Chinese houses converted into workshops—cannot be said to be as imposing as the name would lead one to suppose. No foreign machinery is used, mill-boards, etc., being made by large hand presses, and the various yarns and ropes being woven by hand power weaving machines locally constructed from Japanese models. Besides various products used by factories, the concern turns out pillows stuffed with asbestos waste—a type of pillow very popular with the Chinese. A very good mineral is imported from Kwangtung in small quantities, but the greater part used comes from beyond the pass via Peking and from Manchuria. The product, hand-made as it is, compares favorably with the foreign machine-made varieties, is cheaper in price, and is used by various railway shops and factories throughout China. Workmen employed number 70-80. Of these a great number are apprentices with food and lodging furnished and wages of $1 per month. The other workmen are furnished with lodging and command wages of from $3-$6 per month. The hours of work are 11 per day.

Furniture

There are numerous establishments in the foreign concessions ranging from small carpenter shops to large factories with from 50 to 60 workmen. These specialize particularly in foreign style furniture and are able to duplicate very cleverly anything given them; none of them have machinery, all work being done by apprentices and carpenters.

Bricks

There are no Chinese concerns making bricks and tiles by modern methods but there are a number which make these products by the old Chinese methods.

Soap

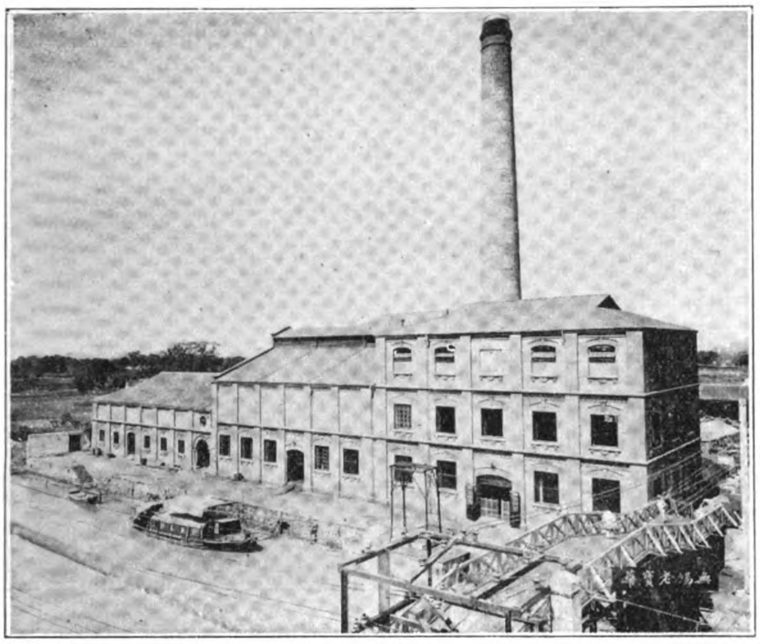
HO CHI TSAO I KUNG SSU, T'UNG HSING TSAO I KUNG SSU, SHUN I TSAO I KUNG SSU and T'IEN CHING TSAO I KUNG SSU.—There are several native style soap-making establishments in Tientsin among which the largest are the Ho Chi Tsao I Kung Ssu at Hsi T'ou, the T'ung Hsing Tsao I Kung Ssu at Hopei, and the Shun I Tsao I Kung Ssu also at Ho Pei. These factories use practically no machinery. The raw material is boiled and alkali added until it is saponified and then it is cooled and cut into strips and bars by hand. The only Chinese-owned factory using foreign machinery is the T'ien Ching Tsao I Kung Ssu located at Ho Pei. This factory was established in 1903 and made soap by the old methods. Foreign machinery from America was installed in 1913, products were exhibited at the Panama exhibition, and since 1915 a foreigner, a soap expert from Holland, has been employed only to supervise the scientific side and of soap making. When the factory is running at full capacity both the foreign and native vats are used. The foreign tank in which the soap is boiled by steam has a capacity of 15,000 pounds, and a new tank is being installed with a capacity of 30,000 pounds. It is also planned to extract glycerine. The factory at present is held up by lack of perfumes which in the past have been purchased in Japan, but which in future on account of the boycott are to be obtained direct from Europe and America. Both washing and scented toilet soaps are made, all of very good quality. Water for the plant is brought from the river and filtered on the premises. The product finds its entire market in Tientsin and North China. The factory running full capacity (when it turns out about 3,000 pounds per day) employs from 80 to 100 workmen. The average working day is 12 hours. Housing and food are provided on the premises. Ap-

(*Continued on page 619*)

A Model Power Plant

An Allis-Chalmers' Installation at Wusih

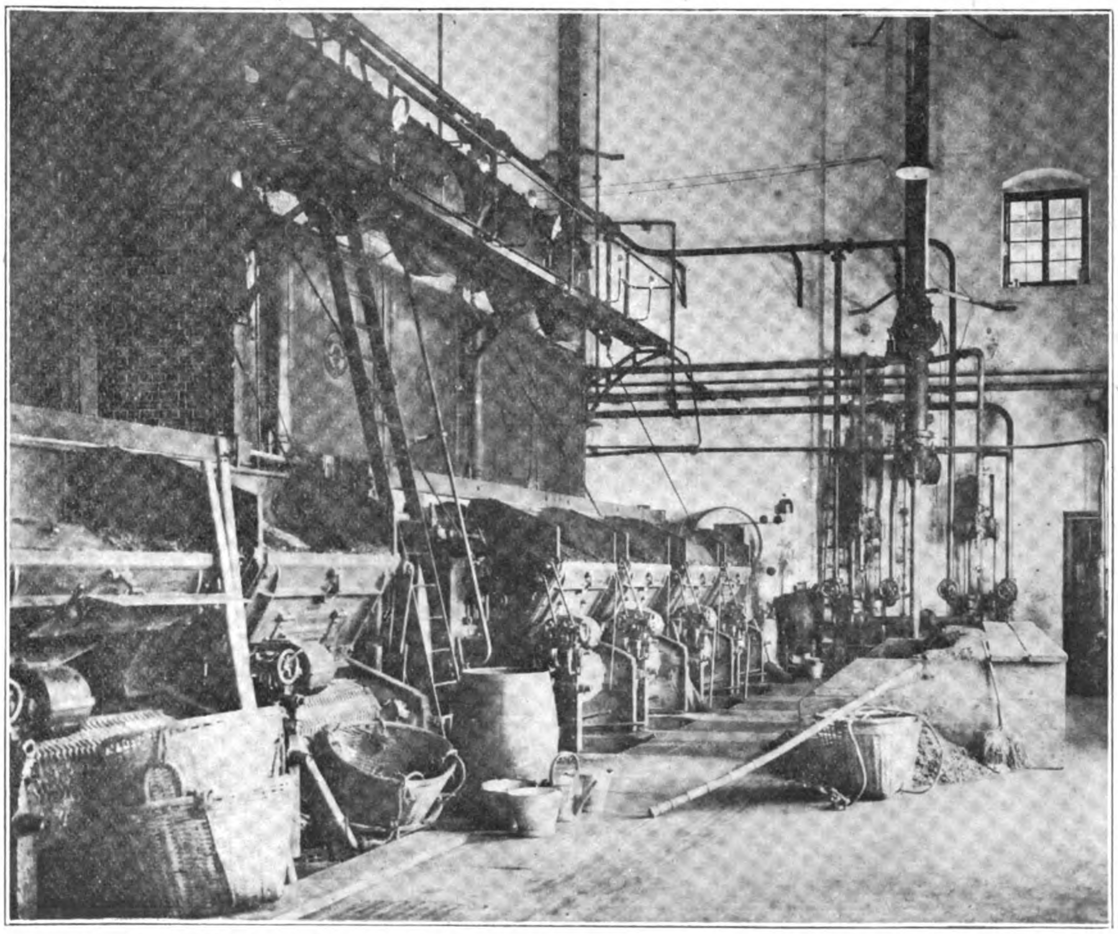
ONE of the most up-to-date central electric power plants recently erected in China, is located on the Grand Canal outside the west water gate at Wusih, the growing industrial centre in Kiangsu province on the line of the Shanghai-Nanking Railway. The plant is owned jointly by a group of industrial enterprises controlled by Mr. T. K. Kung and supplies light and power for the Shen Hsin Cotton Mill No. 3, the Mow Sing Flour Mills Nos. 1 and 2 and to a new 500 loom weaving mill now under construction.



Power House

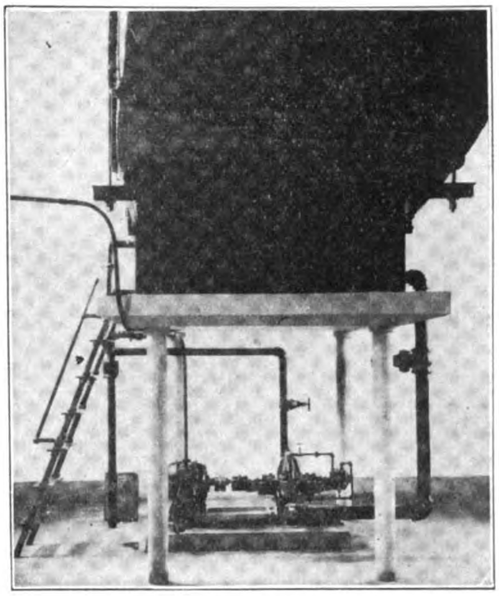
The plant was started in January of this year, under the management of Mr. Doo Ah-sing, who is also chief engineer. The contractors were the American Trading Company who supplied Allis-Chalmers generating equipment, while the boilers were supplied by Jardine, Matheson & Company. The plant was designed and erected by Mr. G. C. Brown of the Allis-Chalmers engineering staff.

The steam generating plant consists of four Babcock & Wilcox water-tube boilers of 4,780 sq. ft. heating surface each equipped with mechanical stokers, using coal fuel with induced draft. The chimney is 185-ft. by 6-ft. There are two Weir vertical boiler feed pumps and two 1,500 h.p. Cochrane open type feed water heaters from the Harrison Safety Boiler Works, in which all the exhaust steam from the steam-driven auxialiaries and air pumps is utilized.



Boiler Room: 4 B. & W. boilers, 4,780 sq. ft. heating surface each, mechanical stokers, induced draft.

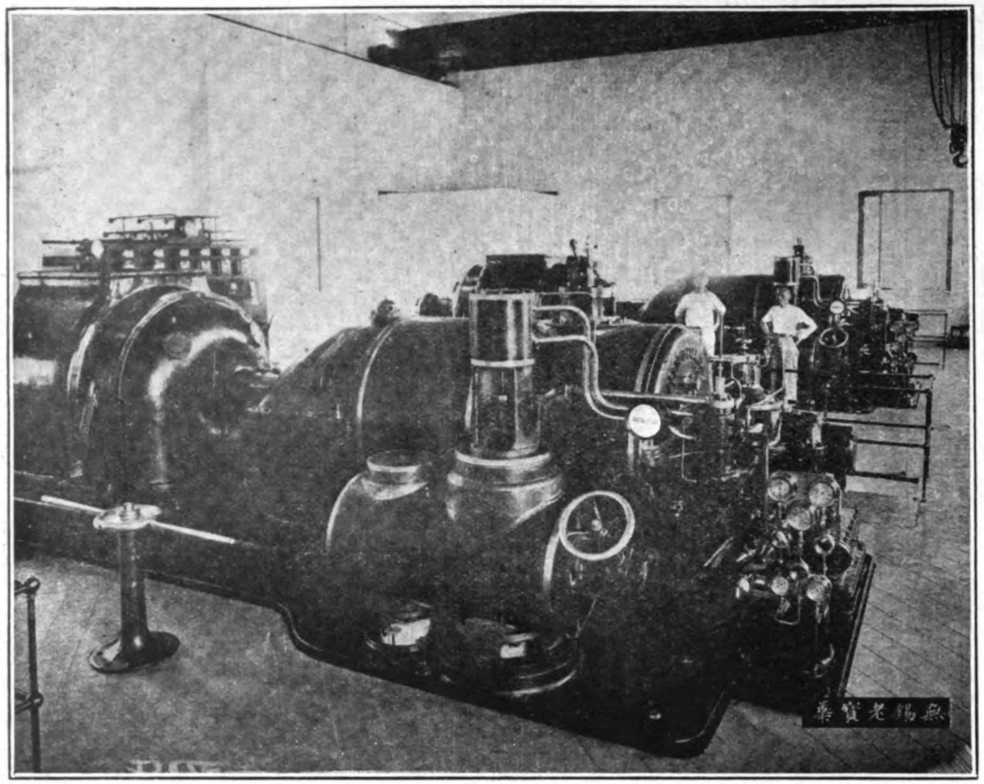
The power units consist of two Allis-Chalmers steam turbo-alternators with direct connected exciters, operating under a steam pressure of 200-lbs., superheated 200°, generators 2,000 k.v.a., 50 cycle, 2,300 volts, 3,000 r.p.m., power factor, 80. Low-tension voltage for lamps, 220 volts and for power 350 : three phase, three wire system. The turbines are of the Parsons type operating under a vacuum of 28 inch. The turbine room is equipped with a ten-ton traveling crane operated by hand. Each generator is equipped with an air washer capable of washing 10,000 cubic feet of air per minute, the washing medium being water, insuring a constant supply of air free of dust and practically at a constant humidity.

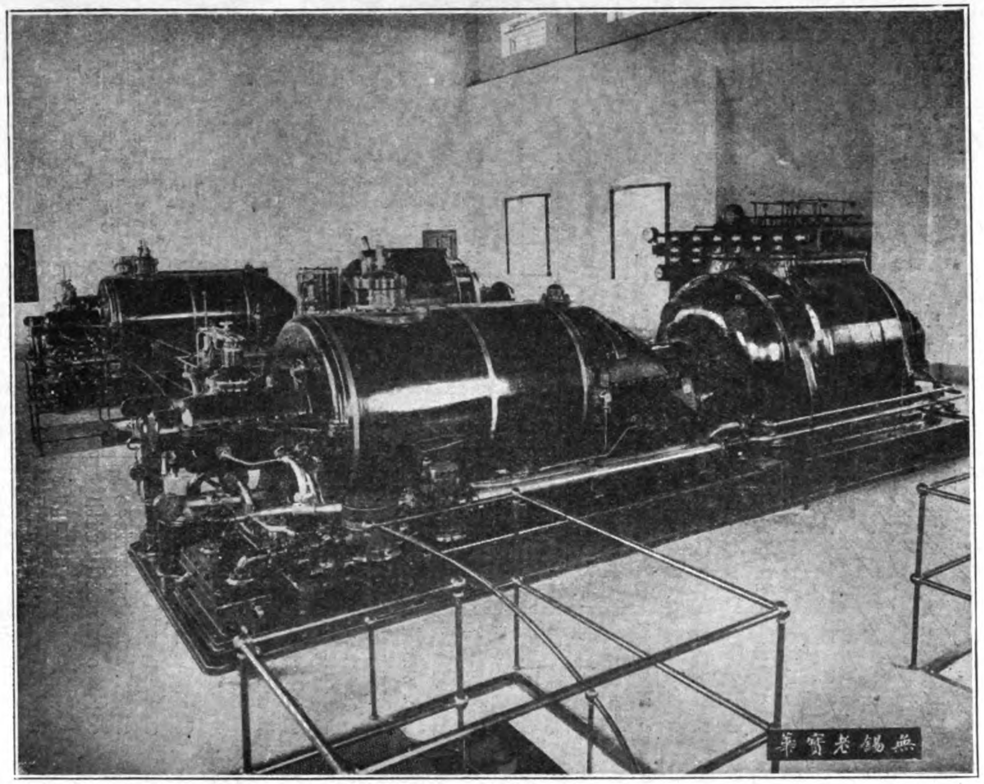


Air Washer

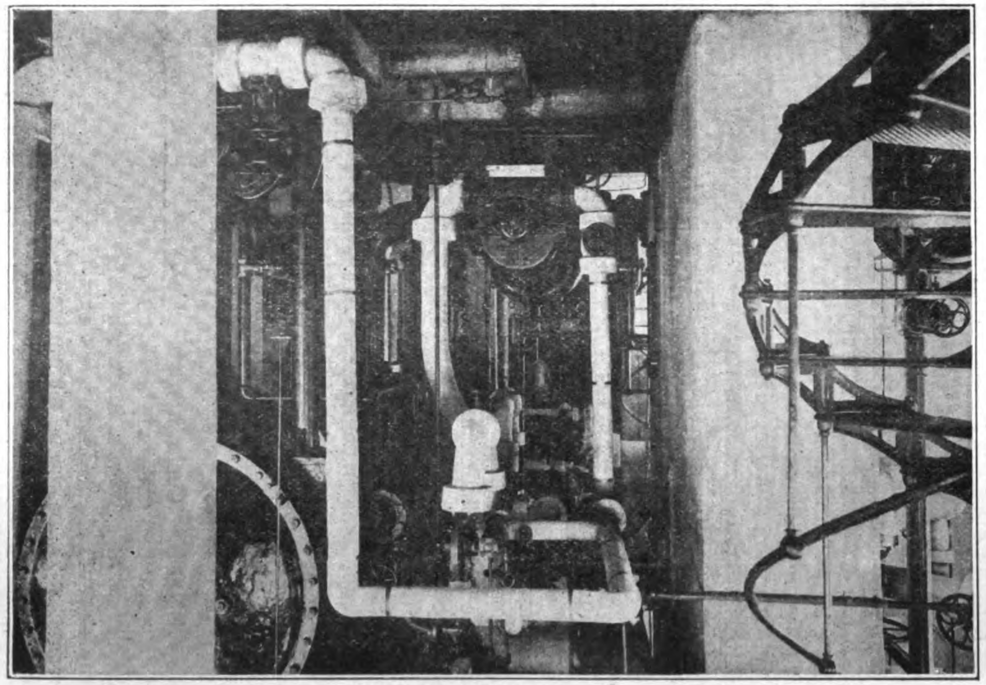
There are two C. H. Wheeler surface condensers of 2,500 sq. ft. heating surface each equipped with Radojet air pumps and circulating and condensing pumps. The circulating pump is driven by a 50 h.p.

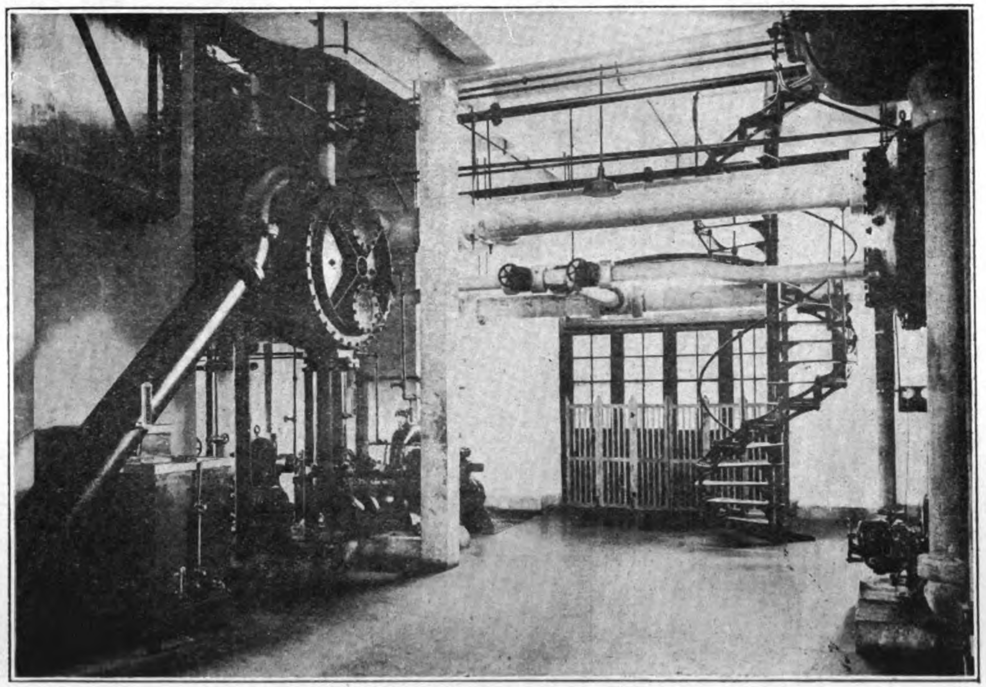
AN ALLIS-CHALMERS' INSTALLATION AT WUSIH





Two Views of Generating Room : Two 2,000 k.v.a. 3 phase, 50 cycle, 2,300 volts Allis-Chalmers Turbo-Alternators, 3,000 r.m.p. Power Factor 80





Views of Condensers : Two 2,900 sq. ft., C. H. Wheeler Surface Condensers : one Condensing Pump driven by 50 h.p. Terry Steam Turbine, the other by 50 h.p. Electric Motor

Terry steam turbine. The condensing pumps are installed in duplicate, one driven by a 5 h.p. Terry turbine and the other by a 5 h.p. electric motor.

The switchboard consists of a seven black slate panels. The first two for the generators one for each machine, the third for the house service through which is derived current at 350 volts from three 50 k.v.a. transformers in the condenser room for operating the motor-driven auxialiaries. The remaining four are the feeder panels for the substations at the mills. Allis-Chalmers transformers and switchboards are in use at the substations. The transmission line is carried overhead on concrete and wooded poles. A private telephone system with a capacity of 30 instruments was installed for communication between the chief engineer's office in the central plant and the several substations.

There is also one 500 gallon, 100-lbs. pressure, 3 stage centrifugal pump driven by an Allis-Chalmers steam turbine and one 500 gallon, 100-lbs. pressure single-phase centrifugal pump driven by an Allis-Chalmers motor, used to provide a supply of cold water through the house service line from which is taken all cold water for boiler make up, oil cooling water and centrifugal pump gland sealing water. When the power plant is operating at full capacity, 8,000,000 gallons of water per day of 24 hours are taken from the Grand Canal. A concrete intake was specially designed and is provided with a double set of stationary screens. These screens are removable by means of an overhead A-frame rigging. The condenser water discharges into a small canal on the opposite side of the power house from the Grand Canal.

TIENTSIN'S NATIVE INDUSTRIES

(*Continued from page 616*)

prentices—boys—receive a wage of about $30 per year. Wages of the other workmen average $6 to $15 and more per month depending on skill and kind of work. The factory impresses one as being very profitably and efficiently managed.

Ironware, Machinery

Pei Yang Ch'uan Yeh T'ieh Kung Ssu and Pei Yang Ch'uan Yhe T'ieh Kung Ssu; established in 1906 with a capital of Tls. 200,000. The iron comes from Hankow; the factory produces railroad materials, machinery and tools; 600 workmen are employed; the plant is British.

Ssu En Chi T'ieh Kung Ch'ang, established at Tung Ma Lu, Native City, in 1907. Besides these there are a number of native foundries.

Greater Osaka Water Supply

A PLAN is afoot says the *Osaka Marnichi* for constructing an aqueduct to draw water from Lake Biwa to supply Greater Osaka in years to come. Should the plan materialise, it is expected that the volume of water supplied to Osaka will be 350 percent, of its present volume. Osaka then will be able to supply water to outlying towns and villages, should they so desire.

At present, the capacity of the reservoir at Kunijima is estimated at 2,200,000 koku per day. Osaka had anticipated that there would be enough water supplied to the city by the present system up to 1931. At the rate of the highest record of supply during the summer, this year, the full capacity is likely to be reached in 1926 or 7.

To Examine Water

The city has requested the Shiga Prefecture Meteorological Observatory to investigate facts about the water of Lake Biwa and its relation to meteorological conditions, while the examination of the quality of the water has been entrusted to Dr. Kwamura of Kyoto University. Experiments of filtering and sterilizing water are being made by Dr. Fujiwara of the city.

According to the new fourth period plan of waterworks maintenance, the full capacity of filtering will be 90 koku per second, that is an average of 7,770,000 koku per day. By means of machines, water can be filtered to the extent of from 400 to 1,000 cubic feet per day.

When that plan is completed, not only Greater Osaka, but also many outlying districts can be supplied with water. Already inquiries have been addressed to Kobe, Nishinomiya, Amagasaki, Takatsuki, Suita. Ibaragi and other cities or towns or villages, to ascertain if they desire water supply.

Even to-day, 18 towns and villages comprising a total population of 382,100 receive water from Osaka city. There are two towns or viliages, with 18,000 people, where waterworks are being constructed to get the supply from Osaka's system. Thirty four other towns and villages, with 155,000 people, have applied for water.

To Discuss Water Supply

The national conference of the municipal authorities regarding the water supply is to be held in the municipal assembly building of Nagoya for a week from October 2, and three officials concerned in addition to the head of the Osaka municipal sanitary investigation office have been appointed to attend. It is learned that in addition to all the cities in Japan proper, those of Manchuria, Chosen, and Taiwan are to participate in the conference. Many questions in connection with experiences, experiments, and investigations in the matter of municipal water supply will be tendered to the conference for discussion with a view to the improvement of supply systems.

Announcement by American Chamber of Commerce of China

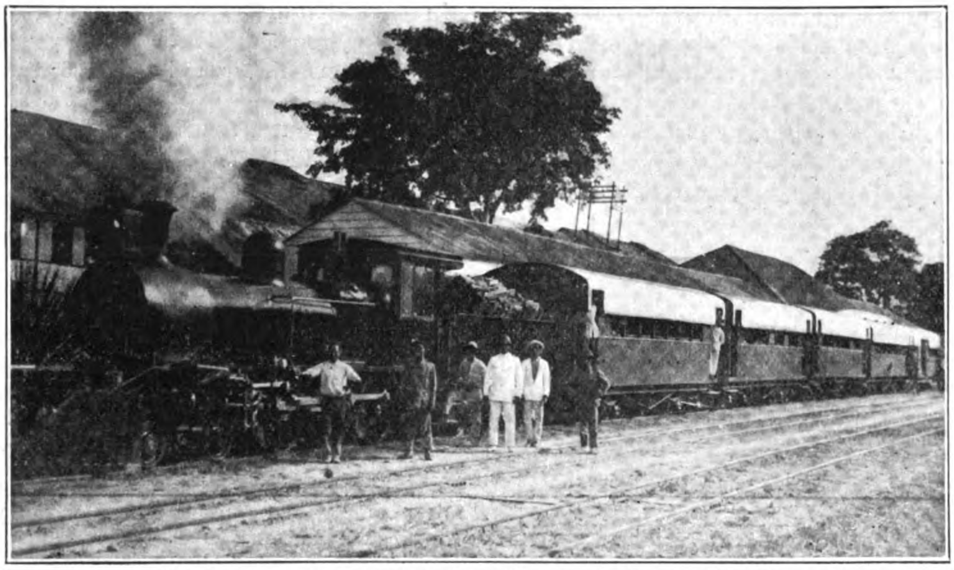
From time to time, stocks in American oil companies are offered on the local markets of China. Full information as to the possibilities of all oil regions and fields in America can be secured without cost by addressing a letter of inquiry to the United States Geological Survey, Washington, D.C., a branch of the American government which has made a close survey of all possible oil fields in the United States and has on file complete data regarding same. When practical, a prospectus of the company marketing the stock should accompany the letter.

North Borneo—A Chinese Colony

By G. C. Irving

EVERYDAY we have reason to realize how little is known about the island of Borneo. Though the British North Borneo Company acquired its rights over its territory forty years ago and has succeeded in reducing the chaos of native rule to a condition of peace and safety, the country still remains but little known. It enjoys a reputation, even at so little a distance as Hongkong and Singapore of being unhealthy, unproductive and beneath the notice of the European capitalist. Actually it is a country with a moderate tropical climate and a generous rainfall capable of maintaining a large population.

More especially and to an eminent degree does this land of plenty provide an ideal existence for the people of China. They have lived and prospered for many years under the government of the chartered company and the only fault we have to find is that sufficient importance has not been attached to the policy of increasing the number of our Chinese colonists. The connection of the Chinese with Borneo dates back to the middle ages. It is a disputed point as to whether the Chinese ever settled in any numbers for there is little reliable evidence of their having done so, but they traded extensively around the coasts of the island and were on friendly terms with the sultans and chiefs.

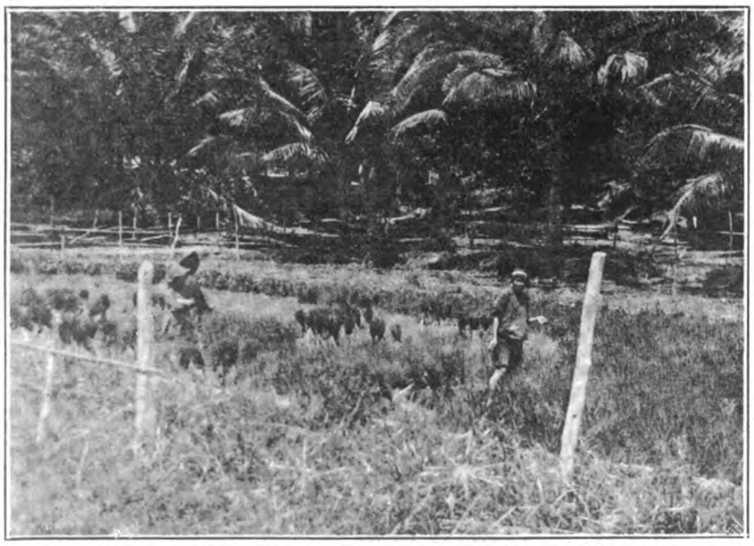


North Borneo Railway: Mail and Passenger Train at Jesselton

When in 1882 the northern part of Borneo passed by treaty into the possession of the chartered company, what trade there was soon came into the hands of the Chinese who settled in Kudat and Sandakan. When the country became safe for the development of large estates, particularly tobacco and coffee, the managers relied entirely upon China for their supply of labor. Medical science was not then what it is to-day with the result that the Chinese contracted fever and other diseases which carried them off in large numbers. No one seemed to worry very much over a high death rate among these unfortunates. The supply of labor was more than equal to the demand and regular supplies of new material were continually coming down from Hongkong. The coolies were placed under a stiff indenture, badly paid and allowed to feed themselves as they liked. Beri beri, the worst scourage of the country, stalked unchecked among the estates and was regarded as incurable and unpreventable.

We do things differently in these enlightened days. Managers regard their labor as their best asset, none but the physically fit are accepted and, once included in the estate labor force, are fed and housed in such a way that the present day sick rate is far below the old death rate. The old indenture has been done away with and what amounted then to a debt bondage no longer exists.

The class that has been steadily coming into the country and is by far the most valuable from an economic point of view is the settler. Recruited principally from southern China and from among the Hakka people, they succeed in making a living within a few weeks of their arrival. The suburbs of all our principal towns and stations have been turned into flourishing gardens. In certain districts the Chinese have mixed with the native population, taken up land that the natives do not want and, to some extent, have married native wives. The settlers provide the towns with fruit, vegetables, poultry and pigs and many of them have acquired



Coconut Estate: The Property of Mr. Chow Ah Qui

Draining new clearing, near Jesselton

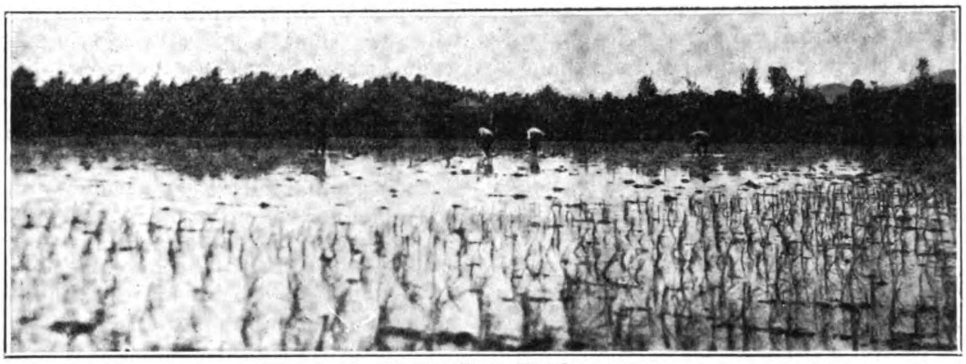
(All Photos by Mann Singh, Jesselton)

quite considerable areas of land which they have planted with rubber or coconuts. They are without exception the most desirable class of people that any country could wish to possess. It is therefore not unnaturally that the government encourage their immigration in every way possible, offer them tempting terms for taking up land and subject them to a very light taxation.

The conditions under which Chinese may come to Borneo to-day are the provision of free passages for themselves and their families and a grant of land up to five acres with purely nominal rent for the first six years. As the North Borneo government is not possessed of great wealth the number of free passages is restricted but every encouragement is given to others who can afford to pay their own expenses for the voyage from China.

Hakka Fruit Seller

The immigrant can take his choice as to how he intends to use the land given to him. He may, as many do, set up as a market gardener, breeding pigs and poultry as well. He may prefer, if his land is suitable, to plant coconuts which, in seven years, will assure him a permanent and handsome return for his outlay, or he may try his land at rice, pine-apples, bananas, ground nuts, sugar, coffee, pepper, gambier or rubber. The last is, like coconuts, a question of waiting for several years but all other forms of cultivation give him a return within a short time and all find a ready market.



In the Rice Fields

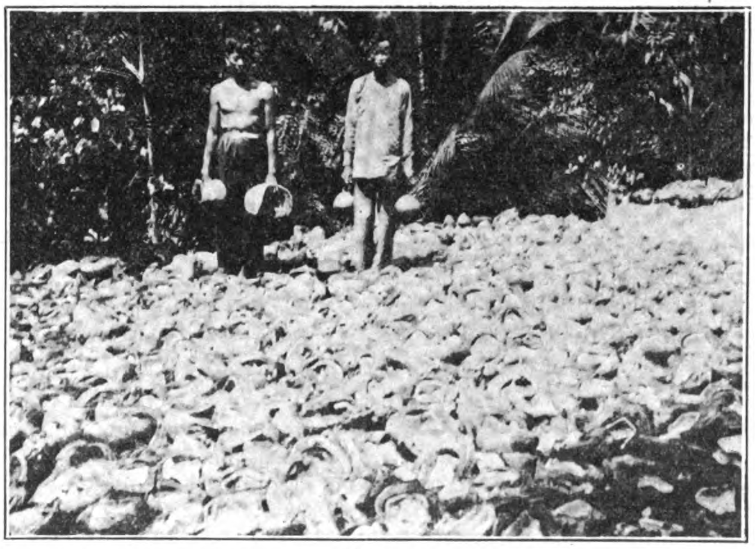
He will find himself unharassed by grasping officials, free to work out his salvation in his own way and to follow the customs of his country and religion without interference. Various missions and societies provide schools for the children of the settlers whose sons as often as not forsake the gardens to become clerks in government offices or business firms.

The successful settler often puts his profits into a small shop and progresses by easy stages from being a penniless coolie to swaggering with the best of them as a full-blown Towkay.

We are beginning to find that the Chinese who become wealthy do not, as was the habit in former days, take themselves and their profits back to China. They prefer to invest it in the country and seem perfectly contented to live out their lives in the land of their adoption.

Even without further immigration their numbers are increasing rapidly. Infant mortality is low and there are ample facilities for medical treatment at most of the settlements. We firmly believe that if the conditions under which Chinese can and do live in Borneo were better known and understood by the southern Chinese we should have to organize a special department to deal with the question of immigration. As it is there seems to be a lot of hesitation on their part before they can make up their minds to abandon their own country. The best means of getting them down that we have found has been to allow established settlers to return to China at our expense and bring down their relations. In this way a steady but limited immigration has been established. The government have more than once tried to organize systematic emigration from China but on each occasion the system has broken down, generally owing to the business being mismanaged in China. Government immigrants arrived burdened with a debt for their expenses from China and for the cost of building their houses. A man who sets out to make good with such a millstone round his neck is seldom if ever a success. Wisely the government has now decided to pay the expenses themselves and to see the return on their money come from the development that settlers bring about. Done in this way, with a hand on the brake to check the influx of undesirables and weaklings, we shall in time reap a rich harvest by seeing our population increase and with it our trade and revenue.

There are in North Borneo immense tracks of country which are practically uninhabited. The country being mountainous practically any form of cultivation up to an altitude of 4,000 to 6,000 feet can be undertaken with success. There is land more than sufficient to plant rice in quantities which would make the country self-supporting as regards its principal food. From the terminus of government railway for instance a road is under construction to connect the plains of Keningau with the coast. On these plains which stretch for over 20 miles there are but a few scattered villages of Muruts, a native tribe who cultivate nothing beyond the land immediately around their villages. The plains are traversed by several rivers which will make a system of irrigation inexpensive to initiate and covering thousands of acres of good land. A Chinese colony established in this valley would prove a flourishing concern within a very short time. Similar areas equally suitable for rice are to be found throughout the country but the government naturally hope to develop the land beyond the railhead to provide freights and passengers for their railway which has so far been a burden on the revenues of the country.



Copra

In additions to the railway and road extension from the port of Jesselton towards Keningau; a road 22 miles long has been built and is now in course of being metalled which will throw open other large tracts of land on the west coast. From Sandakan, the capital and principal trading port on the east coast, road construction has been completed for a distance of fifteen miles penetrating forest country which will become first-class agricultural land when the timber has been felled. These few places which have been specially mentioned would absorb quite 20,000 settlers and still leave the greater part of 30,000 square miles to be developed. As the present resources of the country are not sufficient to finance anything approaching 20,000 immigrants the populating of the country by Chinese must for the present remain more or less a dream.

Much, however, can and should be done by judicious propaganda among the people of south China to induce them to emigrate on their own initiative and found new homes in this rich land. With our small population poverty is practically unknown. A small proportion of the Chinese laboring class do become from sickness or disinclination to work a burden upon the state but the proportion is so small as to be almost negligible men of the artisan and laboring classes find good employment at wages which keep them in comfort. The artisan can command as much as $2 per day and laborers from 40 cents to 80 cents. The cost of living depends, for the Chinese, principally upon the cost of rice which is now about 50 per cent. above pre-war prices and other requirements are by no means costly as taxation is directed more against luxuries than against the necessities of the less wealthy class. The native of the country is entirely self-supporting except for his clothing which he buys from the Chinese traders.

It is to be understood that Borneo is no fever-stricken, pest-haunted tropical swamp but a country capable of maintaining a dense population and of producing much that the outside world can make use of.

The chartered company has successfully carried out its mission of subordinating the indigenous races to civilized rule, it has to a certain extent developed its property but to an extent which is only the beginning of what can and should be done in the future. Its revenues to-day are not sufficient to enable the government to carry out ambitious schemes of development. Its coast is deficient in lights, its harbor backward in facilities for loading steamers and its road system in its infancy. What can be done on the revenues has been done but those who criticise the administration for its backwardness forget that bricks cannot be made without straw. Our greatest want, population, exists in millions in China, we shall do her no harm and ourselves much good if we can successfully indure her access population to try their luck in a new country.

Dutch Activities in China

FOR years past the Hollanders have almost entirely neglected their chances in China and looked passively on whilst Belgians, Britishers, French, Japanese and Germans made a profitable business out of the construction of railways, and supplying the necessary rails, bridges and rolling stock. Dutch activities have been confined to the harbor works at Shanghai and Chefoo, writes the "Gazette do Hollande," but how much more might have been accomplished! It has chiefly been the Belgians who have applied themselves energetically to obtaining command of the Chinese market. Their efforts have considerably benefited the industry of Belgium, which has for years been supplying all kinds of materials to a value of tens of millions of francs per annum. By means of an extremely practical mode of co-operation between Belgian industry and the banks, the Banque Belge pour l'Etranger in China is doing excellent business.

It has now become possible for Dutch business men to participate in one of the large concerns based on the said co-operation. The Dutch syndicate for China has obtained a share in the construction of the Lung-Hai Railway, which will connect Lanchow, the capital of the province of Kansu, with Haichow, on the China sea. On May 1, 1920, and agreement was signed between the said Dutch syndicate, the Chinese government and the Belgian Compagnie Générale de Chemins de Fer et de Tramways en Chine, according to which Dutch engineers will construct the railway from Hsü-chow-fu to Haichow (about 240 kilometres), as well as the ocean harbor at the latter place. These great harbor works will be constructed by contractors to be appointed by the Dutch syndicate for China, whilst the material for railway construction will preferably be supplied by Dutch industry. To finance the undertaking, the syndicate will place a loan of fl. 50,000,000 in Chinese treasury notes on the market. The payment of interest and the redemption of these treasury notes has been guaranteed by the Chinese government and by a special mortgage on the railway, whilst the engineer-in-chief will have absolute control over the expenditure and receipts of the line. This is, therefore, not a state loan in the ordinary sense of the word but an issue of specially guaranteed treasury notes upon security capable of itself producing the means of paying both interest and redemption.

On this solid basis, Holland has begun to take part in the promising economic development of China, says a writer in the "Nieuwe Rotterdemsche Courant." The harbor plans for Haichow have been studied by the Dutch experts and our railway engineers have begun work, and already reached the Great Chinese canal.

It is, therefore, not a little disappointing that the issue of the first part of the treasury loan was not a success on the Amsterdam market. Doubtless, this was partly due to the rumors of civil war in China last spring. Far from shaking confidence, however, the fact that this war did not in the least injure the prospects of the works ought to be reassuring, inasmuch as it has proved that such concerns, involving foreign interests, are respected, even in times of civil disturbances.

Nothing is better calculated to demonstrate the value of old Chinese culture than the fact that civil war or any other political event which in western countries would bring business life absolutely to a standstill, has no power to ruffle the calm of the Chinese people, who perform their daily tasks unperturbed. If one further reflects that China numbers 400,000,000 inhabitants and that its foreign trade as yet represents only fl. 9 per head (as against fl. 1,090 in Holland), it is clear that there are enormous possibilities for trade, industry and shipping in that country with its industrious, intelligent and peaceable population.

Chinese Cement Factory Proposed

PLANS are under consideration for the construction of a small cement plant in the vicinity of Kaying city, which is about 150 miles inland from Swatow, on a branch of the Han river, says the U.S. Commerce Reports. The necessary materials are reported to be found in abundance in this district, and it is intended to test out the possibilities of this business by establishing a small plant, which, if circumstances justify, will subsequently be enlarged.

Descriptive matter and proposals are desired for the cement-making machinery required for a complete plant. Proposals should be addressed to Ching Wen-san, care of Messrs. Tek Hua Seng, Chaochowfu, via Swatow, China. Communications in English can be understood, but correspondence with Mr. Ching Wen-san must be in Chinese. Transactions of this character should be handled through representatives in China, who presumably would be located in Swatow, Canton, or Hongkong, although possibly Shanghai representatives could reach this district.

Radio in China

MR. E. T. LOCKWOOD, writing in the *Radio News*, deals extensively with Radio matters in China. The following is extracted from his article :—

The Chinese government has a few spark stations of moderate power, most of which carry on commercial business. They are efficient stations as far as they go, but at present the government radio facilities are very inadequate. They do not have in operation a single station capable of transmitting regularly over a thousand miles, although many are in contemplation.

The best stations in China are those that the Japanese government has established. There are several powerful stations at strategic points in China. The Japanese are constructing a large station near Peking for the Chinese government at the present time.

The Federal Telegraph Company of America has contracted with the Chinese government for the rection of several high power radio stations, notably one at Shanghai, to be one of the largest in the world. This will be of great value to commercial interests in China because of the irregularity of the cable.

Peking-Tientsin Radiophone

Because of the difficulty of maintaining the regular (or irregular) long distance wire telephone, the China Electric Company, in co-operation with the Chinese government, has put in operation two stations to be used in lieu of the land line between Peking and Tientsin. Speech travels from house telephone in one city, via land wire, then radio, and then land wire again to the house telephone in the other city, a distance of over 70 miles. Both stations are easily heard in Shanghai, a distance of 650 miles. This is the largest service of its kind in the world, and it's in China!

Chinese writing is hieroglyphic and so the Chinese have had to compile a code book of characters corresponding numbers. Thus each character is designated by a number in telegraphic communication. The standard Chinese dictionary contains something like 40,000 characters, but the ordinary number used does not exceed 5,000.

The French have established a system of stations throughout China and Indo-China. They deserve much credit for the way in which they have for years rendered weather forecast service and time signals. The time signal is of the letter type not beating off seconds, and is accurate to within a few seconds. The signals are relayed from the French observatory in Shanghai to the local station FFZ.

Japanese QRM

Much has been said about Japanese interference, intentional and otherwise. The main difficulty seems to be that the transmitters are directly coupled, of course, producing high decrement and a broad wave. The main difficulty with the Japanese themselves seems to be that they have an ingrained liking for repetition, which, with their cumbersome and lengthy alphabet, makes the whole Japanese navy a nuisance to amateur, as well as to professionals, Naval ships of various countries are allowed to use full power in the port Shanghai.

Like most governments the Chinese government intends to be strict with regard to radio regulations. Private radio stations on Chinese territory are frowned at by the authorities and in many instances, they have had to be dismantled, causing the foreign consuls much inconvenience. However, Shanghai is an international settlement, the government being carried on by a municipal council, elected by the people of all nations, exclusive of Chinese. Under these conditions the Chinese government has not attempted to exercise radio jurisdiction as to wave-lengths, power, etc. The amateurs of Shanghai, for the most part, would welcome legislation on the part of the Chinese government, providing the rules were not too strict, for it would give the amateurs their own realm. The Chinese government seems to be too busy running more important affairs and has not had time to enforce regulations on amateur wireless.

Not Much Amateur Transmitting

As a matter of fact, however, since there are no amateurs to send to outside of Shanghai, there has been very little transmitting on the part of amateurs. At present, the few who have powerful transmitters use pretty much whatever they please, as did the one mentioned in the beginning of this article.

Although the writer is informed that there are at present over 100 amateurs in Shanghai, they have never organized a club, but it is anticipated that such an organization will be formed in the near future. Such a radio club would be an innovation in the way of nationalities represented in that it would include Americans, British, French, Dutch, Portuguese, Chinese and possibly several others. It might be able to do a great deal toward putting amateur radio in China on a firm basis.

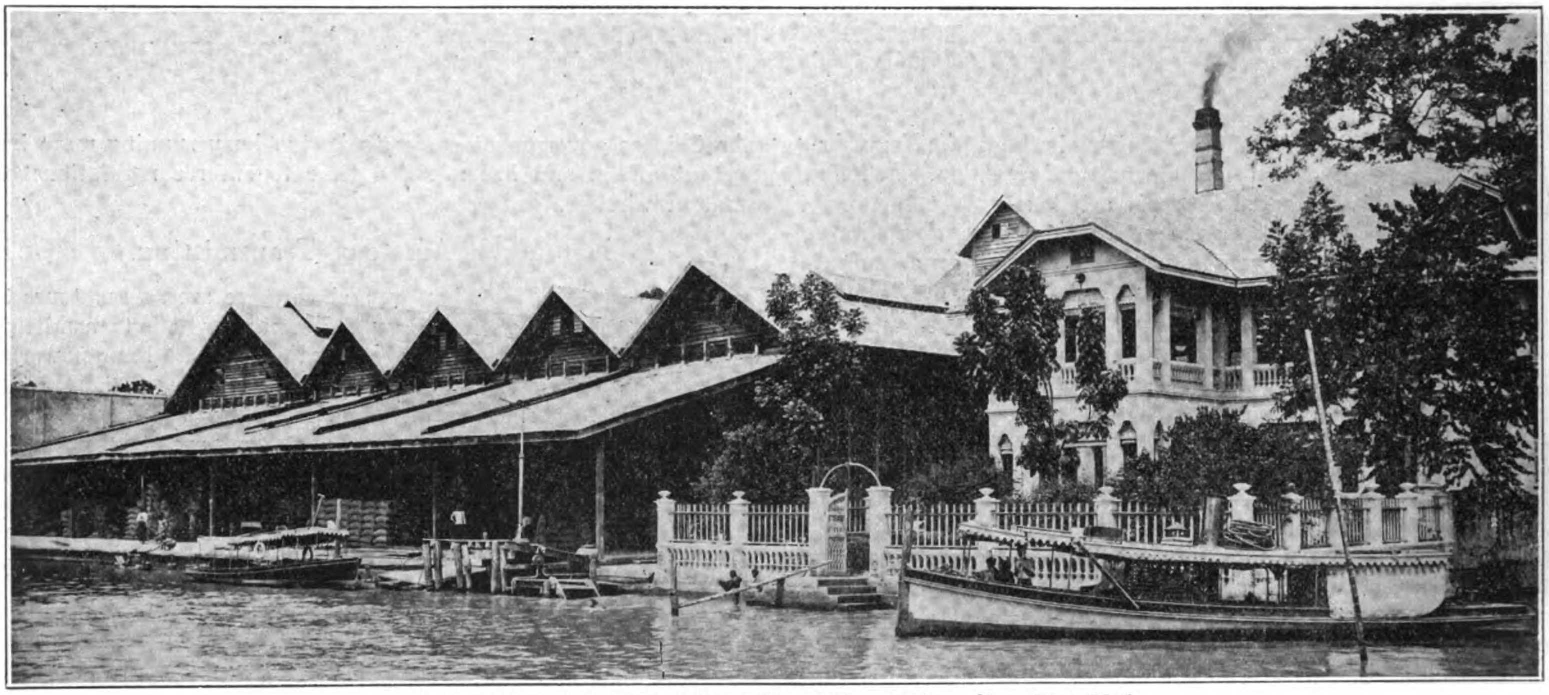
From Coast to Coast

Because of its central location, Shanghai is an admirable place from which to cover the world by radio. It is a convenient thing to remember that London and Paris, Shanghai and Manila, and San Francisco are equi-distant points around the world. European stations come in strong here, both large and small. Pacific coast American stations also come in well. Even atlantic coast stations have been heard in Shanghai. It is a coincidence, and many of you may have heard. Pearl harbor and Nauen sending time signals at the same time, one at noon and the other at midnight. Their wave lengths are such that they both can be heard at one adjustment. The air in Shanghai is practically free from static in winter, but in hot weather it is likely to be very heavy.

A short time ago the writer was astonished to hear perfectly good Peking Chinese language floating around the ether. "The whole world do move!" He was interested to read in a recent number of *Radio News* that Chinese was "just a gurgle." If it is in life a gurgle, over a wireless phone it's a strangling performance.

Nanyang college, at Shanghai, one of the leading Chinese technical schools of the country, has instituted a course in radio engineering. They have been fortunate enough to secure the services of Mr. T. C. Chang, an American-trained radio engineer, who, as head of the department, is rendering great service to radio in China. At present there are about 20 students taking up this line. It is a full-fledged engineering course, not merely a school for operators.

One of the most interesting radio enterprises in China has been the popular educational movement under the direction of Prof. C. H. Robertson of the lecture department of the Y. M. C. A. He purchased, while in America a short time ago, the two complete radio telephone stations which were used in the victory way in New York city during the victory loan drive. These he has cleverly mounted in trunks, so that in a few minutes' time, the two stations can be set up for lecture purposes. On one tour of about 12 cities, 100,000 people heard him speak. To see some old Chinese governor with the phones clamped to his ears, as interested as a kid, is a sight to make one think that China has got to wake up. He has given lectures to the leading generals of the country and even before the president of the republic himself. It would not be surprising if China was one of the first countries in the world to establish a satisfactory commercial network of wireless telephones, because land lines have never been installed. Because of the great distances to be covered and the difficulty of procuring land even to plant telephone poles, the wireless telephone may solve one of the greatest communicational difficulties between China's 1,900 walled cities.



A Typical Bangkok Rice Mill: The Hu Long Heng Chan Rice Mill

Siam's Rice Mills

IN normal years, milled rice forms at least 80 per cent. of all exports from Siam. However, since 1919 the rice market has not been in a normal state, and although the rice shortage of 1919-20 forced the price of rice to an average of Tcs. 16.61 per picul for a total of Tcs. 123,083,000, the output in piculs was 7,409,453 against an average yearly output of 18,000,000. Restriction of export, which was ordered in November, 1919, was not removed until January 1921, and the export of rice for the year ending March 31, 1921, was only 4,660,487 piculs.

The Siamese are essentially an agricultural people, and have devoted 5,959,200 acres, chiefly on the alluvial plains of central Siam, to the cultivation of rice. With few exceptions the paddy is milled in Bangkok, the milling industry being exclusively in the hands of the Chinese. European firms formerly operated rice mills, but were unable to compete successfully with the Chinese. With the seizure of German property in 1917, the last European rice mill went out of existence.

There are 75 steam rice mills in Bangkok, and 4 electric mills. The high value of the tical and the low value of the rupee gave Burmese rice a distinct advantage on the early 1922 market, and 17 Bangkok mills have temporarily closed awaiting a more favorable exchange or an increased demand for rice.

The Chinese millers deal directly with the Hongkong and Sinapore markets, but sell through European firms for the Java and European markets. Occasionally markets in the West Indies and Japan are generally supplied by non-Chinese firms.

PADDY FROM VARIOUS PLACES LANDED AT BANGKOK RICE MILLS INCLUDING RICE MILLS AT PAKLAT AND SAMSEN

(1 kwien = 16 piculs)

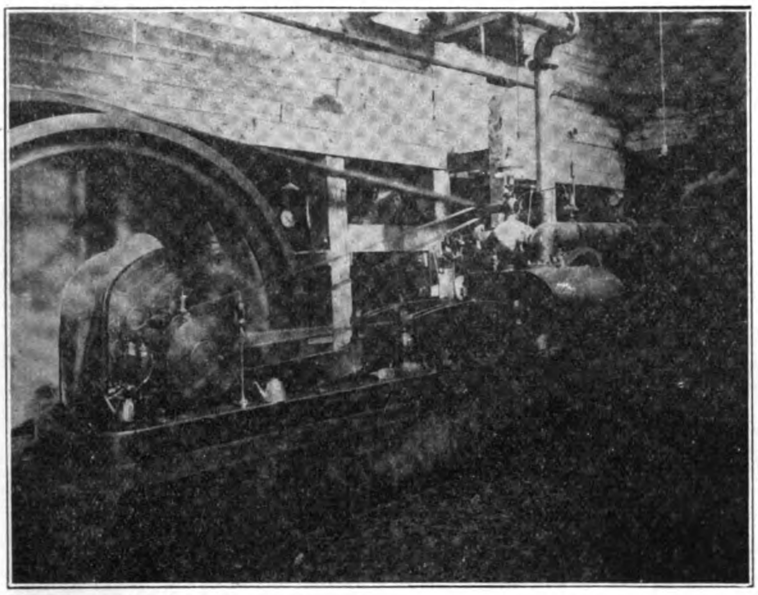
1922 Month	Paddy landed at Mills By Boats Kwiens	By Rails N. Line Kwiens	By Rails S. Line Kwiens	Total Kwiens
January ..	7,418.92	9,340.95	60.00	83,590.87
February ..	78,569.42	13,200.08	105.30	91,874.80
March ..	77,752.57	10,250.92	1,131.47	89,134.96
April ..	72,269.98	12,761.97	1,523.23	86,555.18
May ..	45,195.28	8,185.77	1,633.60	55,014.65
June	47,356.47	10,025.55	1,634.50	59,016.52
July	55,677.20	5,822.77	1,352.60	62,852.57

(Figures supplied by the department of Statistics, Royal Siamese government, Bangkok).

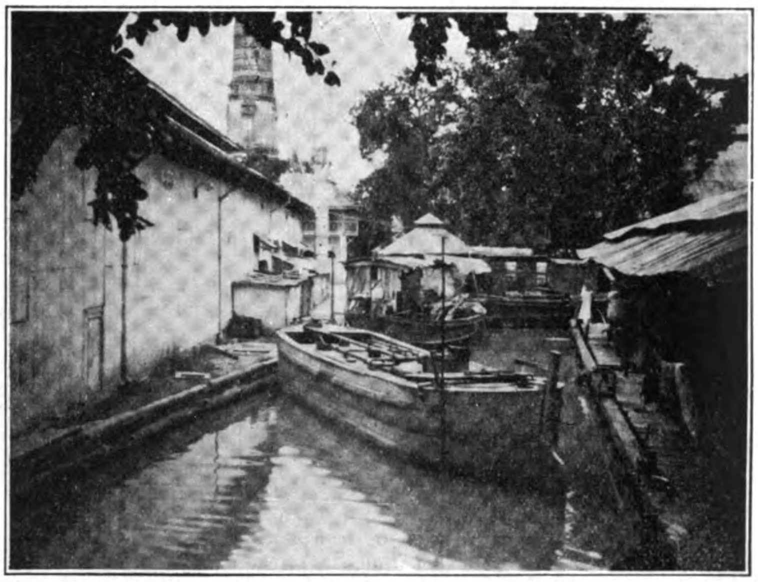
Rice Mills Situated at Bangkok

Mill and Location:

Hoa Heng Seng W. Bank, Menam (Paklat)
Kim Thye Seng, W. Bank, Menam (Paklat)
Kwang Huat Lee, W. Bank, Menam (Paklat)
Eiah Lee, W. Bank (Ratboonak)
Hong Long Huat, W. Bank (Bangpakok)
Nam Heng Lee, W. Bank (Bangpakok)
Chin Seng, W. Bank (Bangpakok)
Kwang Guan Lee, W. Bank (Bangpakok)
Kwang Mong Seng, W. Bank (Bangpakok)
Lim Heng Chang, W. Bank (Bangpakok)
Siang Heng Long, W. Bank (Klong Daokanong)
Chai Soon Kee, W. Bank (Klong Daokanong). Closed
Ngee Seng Huat, W. Bank (Klong Daokanong)
Kwang Hap Seng, W. Bank (Klong Daokanong)
Teck Lee, W. Bank (Klong Daokanong)
Kwang Hong Chiang, W. Bank (Klong Daokanong)
Long Heng Lee, W. Bank (Klong Daokanong)
Siang Kee Chan, W. Bank (Klong Daokanong)
Guan Hoa Seng and Guan Hong Seng, W. Bank (Klong Daokanong). Closed
Liang Huat Lee, W. Bank (Klong Daokanong)
Hoa Heng Chieng, W. Bank (Klong Daokanong). Closed
Li Tit Guan, W. Bank (Klong Daokanong)
Kwang Joo Seng, W. Bank (Klong Daokanong). Closed
Kwang Long Seng, W. Bank (Klong Daokanong)
Guan Cheng Seng, W. Bank (Klong Daokanong)
Fook Lee (Samrei), W. Bank (Klong Daokanong)
Poh Thye Heng, W. Bank (Klong Bang Luang)
Yong Hing Chan, W. Bank (Klong Bang Luang)
Guan Hong Thye, W. Bank (Klong Bang Luang)
Guan Thye, W. Bank (Klong Bang Luang)
Siang Heng Chang, W. Bank (Klong Bang Luang). Closed
Kwang Hoa Lee, W. Bank (Klong Bang Luang). Closed
Nam Seng Chieng, W. Bank (Klong Bang Luang)
Poh Thye Seng, W. Bank (Klong Bang Luang)
Long Heng Chan, W. Bank (Klong Bang Luang)
Yong Thye Hah, W. Bank (Klong Bang Luang)



Long Heng Chan Rice Mill, Engine Room



Fuel for the Boiler Plant of the Siam Electricity Works in Bangkok consists of Rice Paddy Husks, brought from the Mills by Boats to the Power House

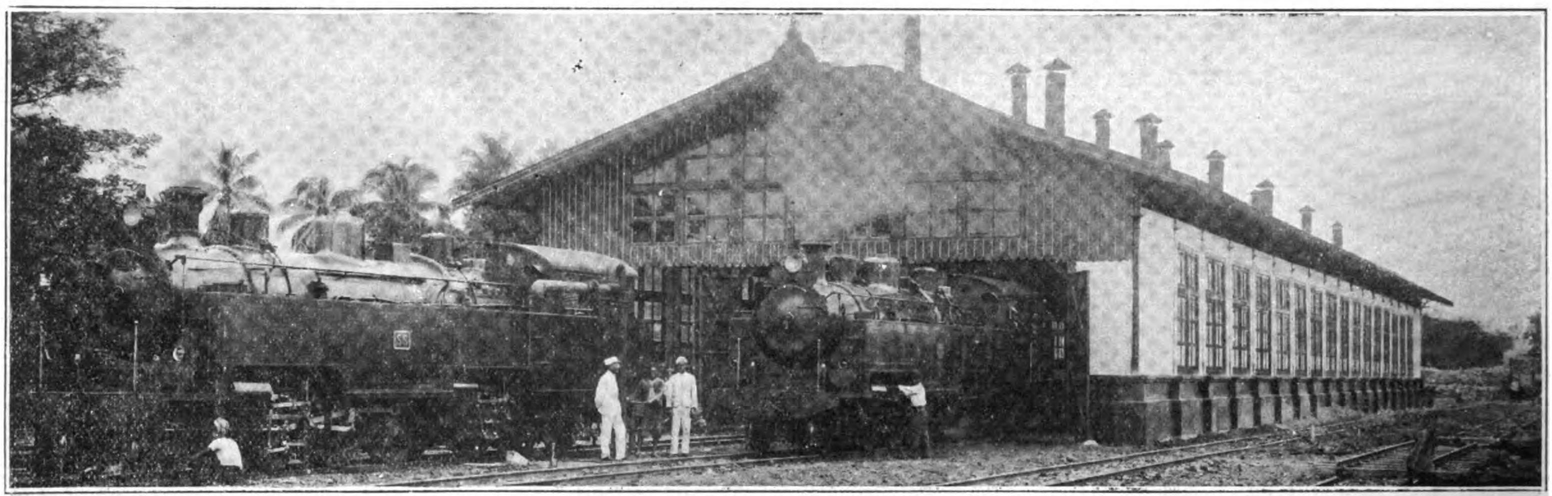
Yong Hong, W. Bank (Klong Bang Luang)
Hoa Heng Chan, W. Bank (Klong Bang Luang)
Thye Heng Lee, W. Bank (Klong Bangkok Noi)
Hoa Heng Lee, W. Bank (Bang Bua Thong)
Liang Huat Lee, East Bank Menam (Klong Prakanong)
Meng Heng Seng, East Bank Menam (Klong Prakanong)
Siang Hong Long, East Bank Menam (Klong Prakanong)
Kwang Long Chieng, East Bank Menam (Klong Prakanong)
Khean Heng Lee, East Bank Menam (Klong Prakanong)
Kwang Heng Seng, East Bank, Menam (Klong Prakanong)
Nam Long, East Bank Menam (Klong Prakanong)
Lim Heng Chan, East Bank Menam (Klong Prakanong)
Guan Lee Chan, East Bank Menam (Klong Prakanong)
Meng Teck Seng, East Bank Menam (Klong Prakanong). Closed
Meng Guang Seng, East Bank Menam (Klong Prakanong)
Kwang Hong Thye, East Bank Menam (Klong Prakanong). Closed
Khoon Chom, E. Bank (Klong Poh Yome)
Long Heng Seng, E. Bank (Klong Poh Yome)
Fook Wah Sen Kee, E. Bank (Bangrak)
Soon Seng Heng (Bangrak), Electric Mill
Guan Heng Lee (Bangrak), Electric Mill
Buan Lee Huat, E. Bank (Klong Kut Mai), Electric Mill
Hoo Hong, E Bank (Klong Kut Mai), Electric Mill
Kiam Lee Heng, E. Bank (Klong Kut Mai), Electric Mill
Heng Hong, E. Bank (Klong Kut Mai), Electric Mill
Lo Jin Hong, E. Bank (Klong Kut Mai), Electric Mill. Closed
Kim Seng Guan, E. Bank (Klong Kut Mai), Electric Mill. Closed
Seng Nam Heng, E. Bank (Klong Kut Mai), Electric Mill
Hoa Hong, E. Bank (Klong Kut Mai)
Eam Mong Chan, E. Bank (Klong Kut Mai). Closed
Mean Heng Chan, E. Bank (Klong Kut Mai)
Soon Hoa Seng, E. Bank (Klong Hoa Lampong). Closed
Sang Hak Heng, E. Bank (Klong Hoa Lampong)
Seng Heng Lee, E. Bank (Klong Hoa Lampong). Closed
Jin Hoa, E. Bank (Klong Hoa Lampong), Electric Mill
Kim Hoa Long, E. Bank (Samsen). Closed
Hong Choon Huat, E. Bank (Samsen). Closed
Sieng Hong Long, E. Bank (Samsen)
Khean Lee Chan, E. Bank (Samsen)
Joo Huat Seng, E. Bank (Samsen). Closed
Guan Tit Lee, E. Bank (Samsen)
Kim Guan Seng, E. Bank (Bangpo)

Siam Mills Elsewhere than in Bangkok

Kim Hoa Chua, Patriew
Kim Hoa Seng, Patriew
Kim Seng Lee, Korat
Ching Ying Soon, Pak Penang, Sritamarat Province
Who Hong, Pak Penang, Sritamarat Province
Kuang Nam Heng, Pak Penang, Sritamarat Province
Ea Lee, Pak Penang, Sritamarat Province
Ho Soon Hin, Pak Penang, Sritamarat Province

Chinese Engineering Agency Formed

FOR the first time in the history of China, a group of foreign-educated Chinese have established a "General Engineering and Consulting agency" in Peking. The principal objects of the agency are to facilitate the Chinese and foreigners secure exact, concise and correct information on the various technical subjects in this country in the shortest possible time and at the least expense; to investigate and offer advice on engineering undertaking to be started or already in operation with reference to sources of raw materials, transportation facilities, labor costs, etc.; to recommend technical men to suitable positions; to furnish proposals, plans, specifications, drawings, agreements and estimates on new engineering projects; to render correct and concise technical translation from Chinese subjects to English or French or *vice versâ* and to supply confidential trade reports at intervals to firms or individuals, who may thus be kept in intimate touch with the pulse of the demand of the day. Similar service will be rendered to Chinese clients. Mr. Chung, who is in charge of the agency, says that his office sells service only and does not propose to act as agent or to sell any goods for any manufacturer, though consulting engineers, they may recommend to prospective buyers certain products suitable for the Chinese markets.



German Locomotives used on the Java State Railways. All the engines in Java are of German or Dutch manufacture with the exception of a dozen locomotives from the American Locomotive Company used on the mountain lines between Krawan and Padalarang

N.E.I. State Railways and Tramways

Report for year ending 31st December, 1921

SUBMITTED to the members of the colonial council (volksraad) and the Dutch parliament as a basis for the budget of 1923 by the board of managers of the state railways.

1st Part. General Data

1. RAILROADS AND TRAMWAYS

A. Open Mileage

Number of *kilometres* being worked at the end of 1920: in Java gauge 1,007 metres, 2,510: of which 64 kilometres are double track; 3.6 km. triple track; 5.3 km. quadruple, and the remainder, single track.

Gauge 0.600 metres, single track, 120; opened for traffic in 1921, single track gauge 1.067 m., 127; total number of kilometres at the end of 1921, gauge 1.067 metres, 2,637; gauge 0.700 m., 120.

In Sumatra (gauge 1.067 metres) the number of kilometres at the end of 1920 was 488; gauge 0.750 m., 511; opened for traffic in 1921, gauge 1.067 metres, 44: total kilometres at the end of 1921: gauge 1.067 metres, 532; gauge 750 m., 511.

Total number of kilometres in Netherlands India, worked by the state:

1.067 metres gauge, 3,169; 0.750 m. gauge, 511; 0.600 m. gauge, 120: total, 3.800 (2,125 miles).

B. Working Results (in florins)

	1919	1920	1921
Total capital expenditure to lines being worked, inclusive rolling stock and further equipment	343,201,164	369,489,938	411,446,853
Total earnings	56,543,471	68,875,918	78,557,184
Gross working expenditure inclusive of renewals, depreciation, relaying and strengthening	39,001,162	61,149,229	68,758,482
Net Profits	17,542,309	7,699,689	9,798,702
Revenue by passengers ..	22,435,503	29,565,128	33,315,287
,, ,, goods	27,655,148	31,058,448	36,002,124
Ratio of expenditure to earnings	69%	88.7%	87.5%

* 2. ROAD MOTOR SERVICES

		Kilometres
In the province	Palembang (Sumatra)	763
,,	Benkoelen (Sumatra)	567
,,	West coast of Sumatra and Tapanoelie (Sumatra)	930
,,	Cheribon (Java)	101
,,	Preanger Regentschappen (Java)	88

B. Working Results (in florins)

	1919	1920	1921
Balance of capital account at 31st December	1,155,915	1,558,213	1,478,257
Total earnings	1,558,797	2,076,739	1,848,831
Gross working expenditure ..	1,265,688	2,002,174	2,193,898
Net profits	293,109	74,565	345,067 (loss)
Revenue by passengers	940,623	1,262,382	1,134,310
,, ,, goods	572,211	754,698	680,451

Compared with 1919 there was a considerable increase of working costs in 1920, mainly due to necessary cost of living allowances to the whole staff and higher rates of pay to laborers. In 1921 the increase was due to advances in expenditure on the heads maintenance of way and works, inclusive of strengthening of bridges, Fl. 780,000; running expenses owing to increased consumption of fuel and oil, Fl. 3,400,000; traffic expenses owing to increased traffic and the employment of additional staff consequent upon the new regulation of periods of duty (service, labor and resting time), Fl. 1,800,000.

Consequent upon these important increases of the working expenses a committee was appointed to consider and report upon the possibility of decreasing the working expenditure. The investigation had no immediate important result. A slower introduction of the new regulation on service, labor and resting time, reorganization of the stores department and of the management of the workshops were some of the measures proposed by the committee.

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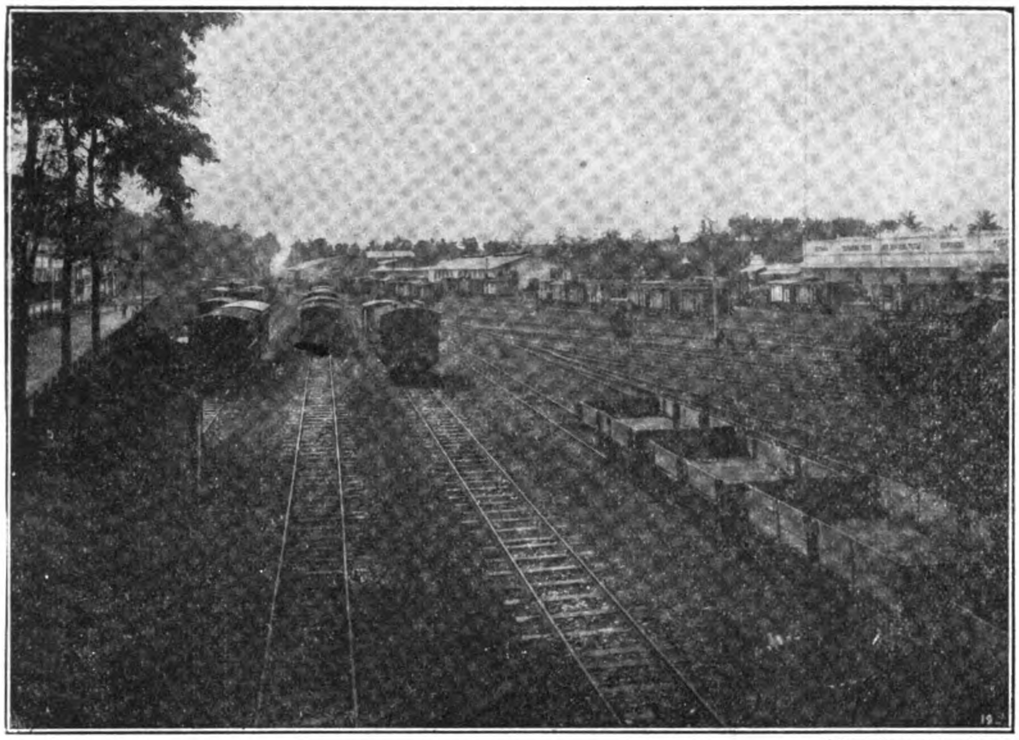
* The detailed report on the Road Motor Service was published in the Motor Section of The Far Eastern Review, September, 1922.

Besides it was not deemed advisable to advance rates and fares, in view of the unfavorable conditions abroad of which the influence is felt by trade and agriculture in Netherlands India.

It is impossible to predict how long the universal uneasiness in trade and agriculture will last and it is therefore very necessary to follow an utmost prudent financial policy.



Freight Yard of the Java State Railways at Bandoeng (Kurkdjian, Sourabaja)

Accordingly it has been investigated how far in the near future the increase of the capital expenditure can be limited without prejudicing the earnings. This was found possible by postponing the construction of some works and delaying a part of the extension program. Consequently, the total amount of the working scheme for 1921 could be brought 3 millions of florins beneath the authorized budget figure and for 1922, 17 millions less.

2nd Part

RAILROADS AND TRAMWAYS

Part 1. In Java

Stores.—Replenishing of the stock has been temporarily stopped and orders in Europe and in the colony were cancelled in so far as it was possible. Only indispensable purchases were made to assure a regular service.

Double Tracks.—April 1st the Krawang-Tjikampek line was double tracked a distance of 21 kilometres, was opened to traffic and the section Meester Cornelis to Bekassi, a distance of 15 kilometres, is nearly completed. As soon as the new bridges over the Tji (river) Taroem and Bekassi river are received and erected, the double tracking of sections Kedoenggedeh to Krawang (6 kilometres) and Bekassi to Tamboen (7 kilometres) will be opened for traffic. In East Java the doubling of the Wonokromo-Krian line (21 kilometres) is being continued while work on doubling the section Krian to Modjokerto has been stopped. The survey for doubling the Kroja-Idjoe-Wonosari line (53 kilometres) is in progress and the survey for doubling the sections Manggarai to Buitenzorg (45 kilometres) and Modjokerto to Kertosone (40 kilometres) was started. Plans and estimates for doubling the section Padalarang to Bandoeng (12 kilometres) have been prepared.

Relaying.—The sections Bandjar to Tjipari (28 kilometres) and Bangil to Pasoeroean (16 kilometres) have been relaid with rails of 33.4 kilograms per metre (in England known as 80-lb. rails). A total of 1,200 kilometres has already been relaid.

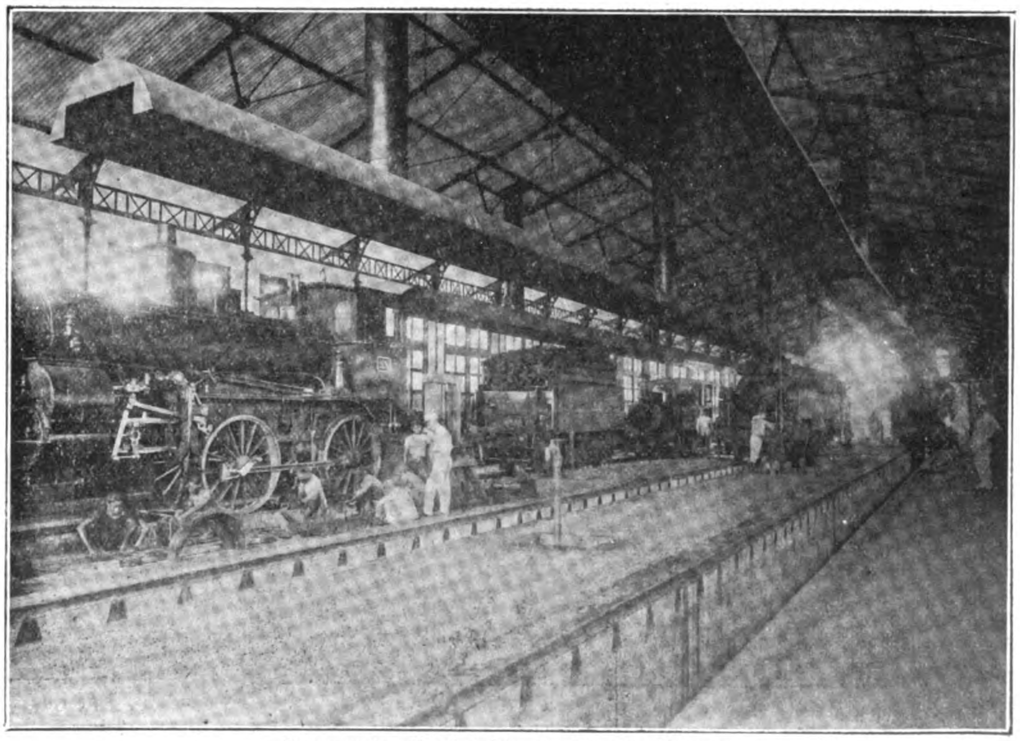
Rolling Stock.—During the year, 81 standard gauge *locomotives* were placed in service with 63 still on order. The number of engines in service on the standard gauge lines in Java on 31st December, 1921, was 578. 78 new coaches for standard gauge and 8 narrow (0.600 metre) gauge coaches were placed in service during the year, all of which were built in the administration's workshops. The wagon stock at 31st December, 1921, was 13,561 standard gauge; 1,873 new goods vehicles, all built in the administration's workshops, were placed in service.

Steamship—Workshops.—To facilitate and accelerate more important repairs, situated at a great distance from the central workshops, small workshops have been erected.

Working Results (of Standard Gauge Railroads and Tramways)

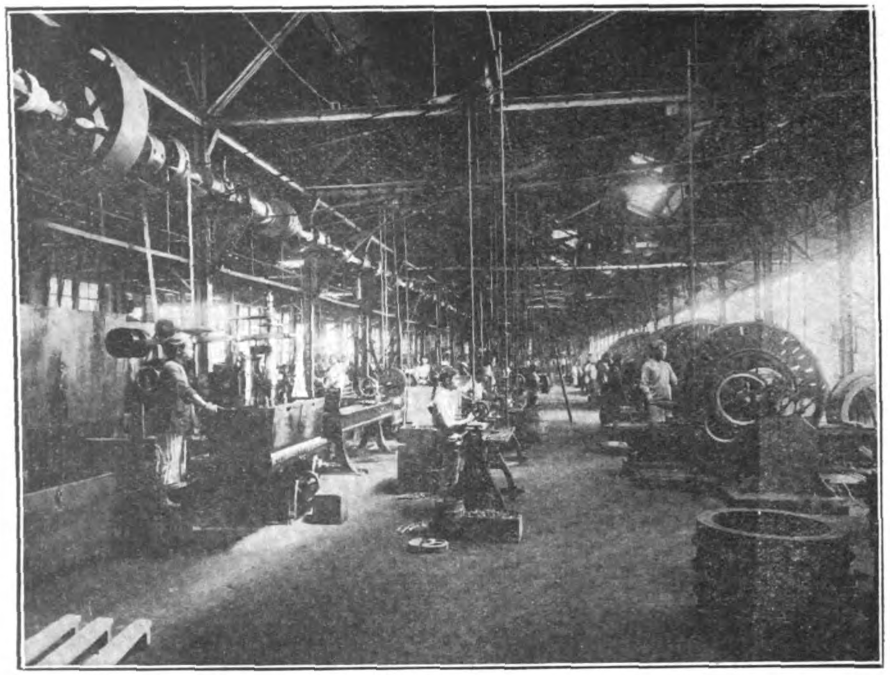
	1921 florins	1920 florins	Increase florins
Gross earnings	68,517,244	59,809,798	8,707,448
Gross expenditure	57,795,649	50,773,621	7,022,026
Earnings in excess of Expenditure	10,721,595	9,036,177	1,685,418

Compared with 1920 there was an increase in earnings of 15 per cent. and an increase in expenditure of 14 per cent.

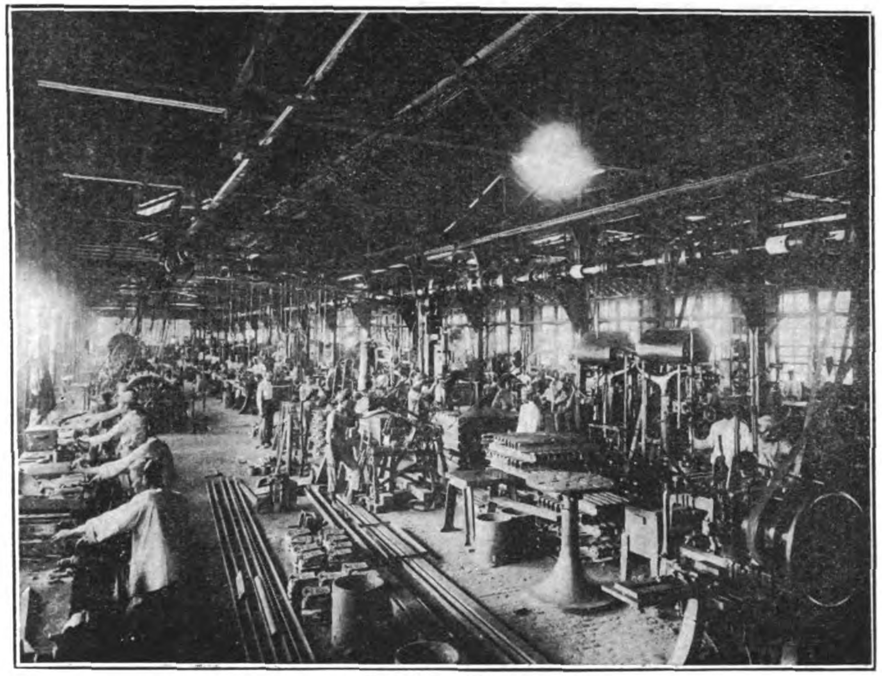


Locomotive Shed at Manggarai, near Batavia

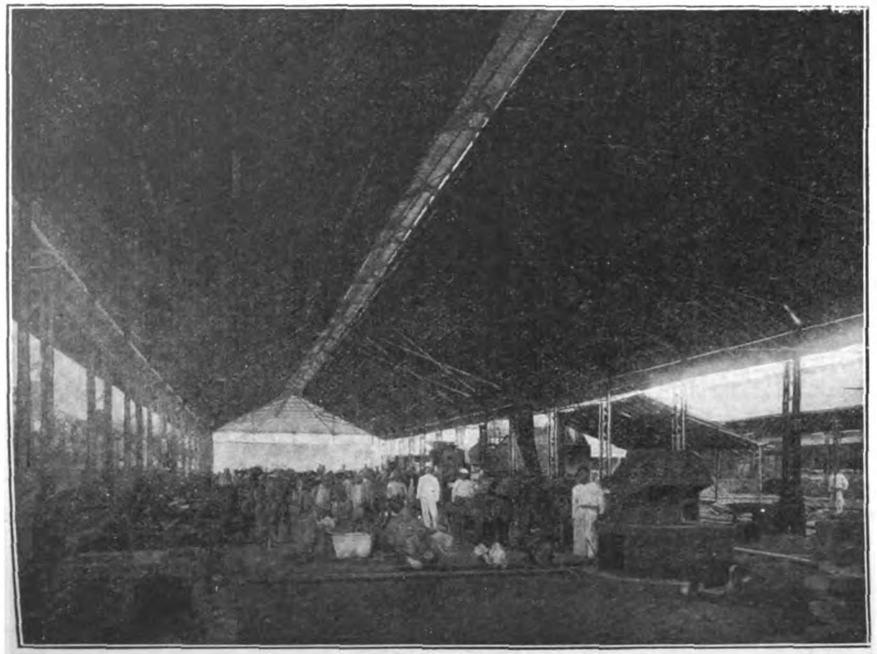
WORKSHOPS OF THE N.E.I. RAILWAYS



Madioen Shops

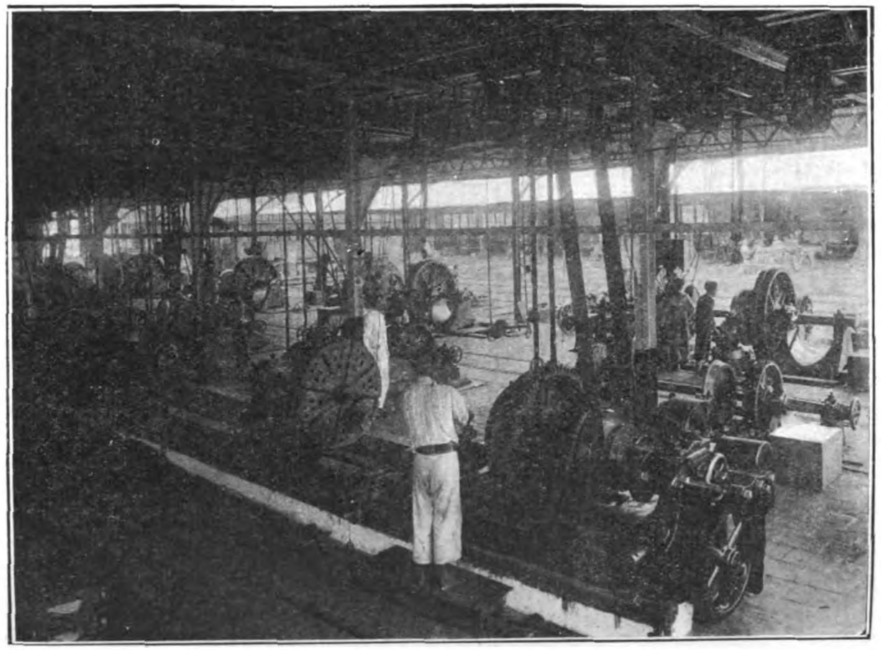


Manioen Shops

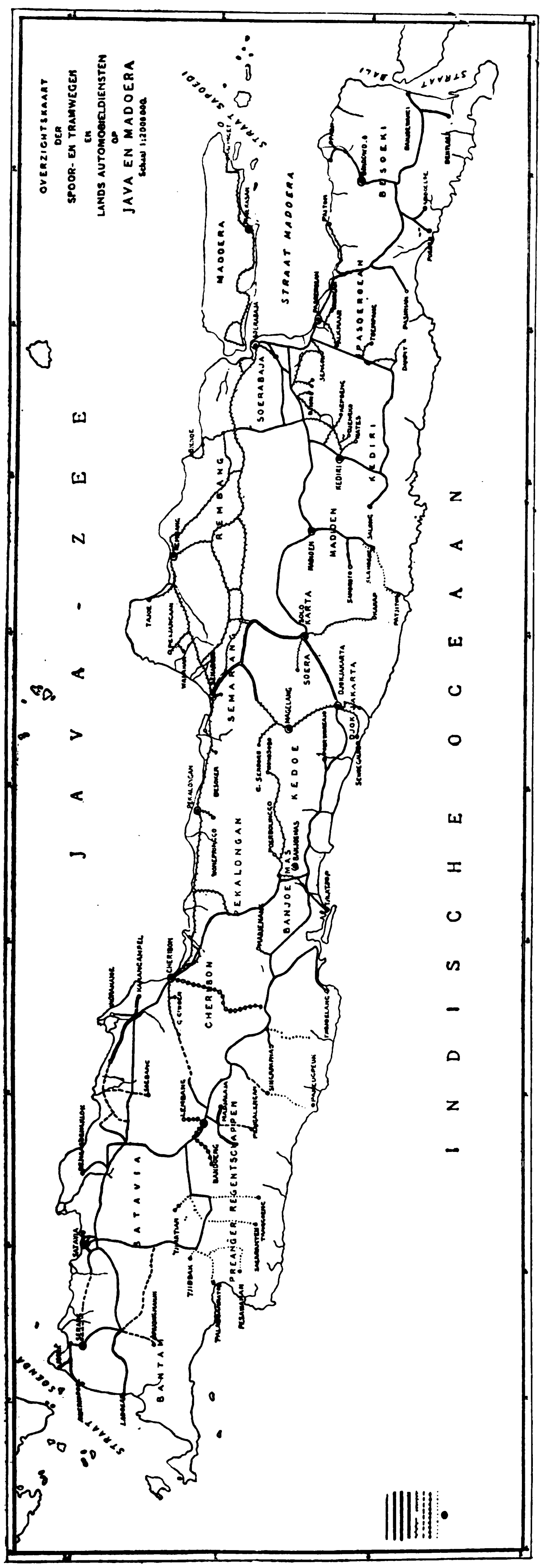


Forge Shop at the Madioen Shops

(Photos by Kurkdjian, Sourabaja)



Wheel "hospital" at the Bandoeng Shops



Earnings.—The earnings under the several main heads and the percentage under each head to total earnings were as follows :

	1921	Per cent. of Total Earnings	1920	Per cent. of Total Earnings
	florins		florins	
Passengers	29,843,712	43.5	26,281,145	44
Luggage	679,962	1	586,230	1
Parcels	2,734,372	4	2,124,816	3.4
Goods	30,705,580	45	26,413,280	44
Live stock, corpses and carriages ..	393,329	0.5	375,378	0.6
Other traffic receipts	4,160,289	6	4,028,949	7
Totals	68,517,244	100	59,809,798	100

The total earnings per day kilometre, compared with 1920 were: 1921, fl. 72.62 ; 1920, fl. 65.16. The increase of passenger earnings was 13.55 per cent. and increase of goods earnings was 16.25 per cent.

Expenditure.—The working expenditure inclusive of double tracking, relaying and strengthening but exclusive of renewals and depreciation, was :

1921, fl. 57,795,649 or fl. 61.25 per day kilometre.

1920, fl. 50,773,621 or fl. 55.31 per day kilometre.

showing an excess of fl. 7,022,028 or 13.8 per cent.

The ratio of expenditure to earnings compared with the previous year was : 1921, 84 per cent. ; 1920, 85 per cent. There were increases under all heads, as follows :

	1920	1921	Increase Total	Increase Per cent.
	florins	florins	florins	
General charges ..	5,091,409	6,129,796	1,038,387	20.39
Maintenance of Way and Works ..	6,220,370	6,999,394	779,024	12.53
Maintenance of rollingstock and running expenses ..	25,694,832	29,097,381	3,402,549	13.24
Traffic expenses ..	13,767,010	15,569,078	1,802,068	13.10

Minor or Simple Lines*

Java.—The following new standard gauge tramlines were opened during the year : Bandoeng-Soreang and connection Karees-Kiaratjondong, 25.83 kilometres ; Rantjaekek-Tandjongsari, 11.23 ; Kalipeotjang-Tjidjoelang, 38,807 ; Gempolkerep-Plosso, 19,549 ; Rogodjampi-Srono, 12,390.

Sumatra.—Blambangan-Kotaboemi, 19,796 kilometres ; Garoentang-Telokbetong, 3,935 ; Pajacombo-Limbanang, 20,221.

At the end of the year the following simple lines were open for traffic :—

Java

1. State tramways in the provinces of Sourabaia and Madioen : gauge, 1,067 milimetres : total length, 173 km. ; (*a*) Krian-Plosso, 46 km. : (*b*) Babat-Djombang, 71 km. ; (*c*) Madioen-Ponorogo-Soemoroto with branch line Ponorogo-Baloeng, 56 km.

2. State tramways in the district of Krawang : (1) Gauge, 1,067 mm., total length, 19 km. ; Djatibarang-Indramajoe. (2) Gauge, 600 mm. : total length, 80 km. ; (*a*) Tjikampek-Tjilamaja, 28 km. ; (*b*) Tjikampek-Wadas, 16 km. ; (*c*) Krawang-Rangasdengklok, 21 km. ; (*d*) Lamaran-Wadas, 15 km.

3. State tramway Rambipoedji-Poeger with branch line Baloeng-Amboeloe : Gauge, 600 mm., total length, 41 km.

*In Netherlands India the tramways take up a part of the conveyance of passengers and goods ; they are considered as 3rd class railways and have another character than the town or vicinal tramways abroad. A special division of the railway administration is charged with the management of tramways, the second class railway in Sumatra and the road-motor services. As the working of all these lines, compared with the principal railways, is simple, that division is called "Division of Simple Lines."

4. State tramways near Bandoeng : Gauge, 1.067 mm. ; total length, 38 km. ; (a) Rantjaekek-Tandjongsari, 12 km. ; (b) Bandoeng-Soreang with connection Karees-Kiaratjondong, 26 km.

5. State tramways in the east part of the province of the Preanger Regencies : Gauge, 1.067 mm. ; total length, 101 km. ; (a) Tasikmalaja-Singaparna, 17 km. ; (b) Bandjar-Tjidjoelang, 84 km.

6. State tramway Rogodjampi-Srono : Gauge, 1.067 mm. ; total length, 12 km.

SUMATRA

1. State tramway in Atjeh : Gauge, 750 mm. ; total length, 511 km.

2. State tramways in South Sumatra : Gauge, 1.067 mm. ; total length, 267 km. ; (a) Palembang Line, Kertapati (Palembang)-Praboemoelih-Moearaenim-Tandjong, 165 km. ; (b) Lampong Line, Pandjang-Tandjongkarang-Laboeanratoe-Hadjipemanggilan-Blambangan-Kottaboemi with connection Telokbetong-Garoentang, 102 km.

3. State railway at the west coast of Sumatra : Gauge, 1.067 mm. ; total length, 265 km., of which 50 km. is rack railway and 215 adhesive track.

WORKING RESULTS

The results of the standard (1.067 millimetres) gauge tramways in Java are included in those of the mainline.

I. STATE TRAMWAYS IN THE DISTRICT OF KRAWANG

(Gauge 600 millimetres)

	1921 florins	1920 florins	Increase florins
Gross earnings	392,963	361,729	31,234
„ expenditure	341,960	303,184	38,776
			Decrease
Earnings in excess of Expenditure	51,003	58,545	7,542

Compared with 1920 there was an increase in earnings of 8.6 per cent. and an increase in expenditure of 12.7 per cent.

Per day kilometre the earnings and expenditure were :

	1921 forins	1920 florins
Gross earnings	13.45	12.36
„ expenditure	11.71	10.35

II. STATE TRAMWAY RAMBIPOEDJI-POEGER WITH BRANCH LINE BALONG-AMBOELOE

(Gauge 600 millimetres)

	1921 florins	1920 florins	Increase florins
Gross earnings	274,763	253,439	21,424
„ expenditure	211,690	175,850	35,840
			Decrease
Earnings in excess of expenditure	63,073	77,589	14,516

Compared with 1920 there was an increase in earnings of 8.4 per cent. and an increase in expenditure of 20.4 per cent.

Per day kilometre the earnings and expenditure were :

	1921 florins	1920 florins
Gross earnings	18.36	16.88
„ expenditure	14.15	11.71

III. STATE RAILWAY AT SUMATRA'S WEST COAST

	1921 florins	1920 florins	Increase florins
Gross earnings	5,460,203	5,205,348	254,855
„ expenditure	4,197,667	3,714,016	483,651
			Decrease
Earnings in excess of Expenditure	1,262,536	1,491,332	228,796

Compared with 1920 there was an increase in earnings of 4.8 per cent. and an increase in expenditure of 13 per cent.

Per day kilometre the earnings and expenditure were :

	1921 florins	1920 florins
Gross earnings	58.44	58.05
„ expenditure	44.73	41.42

The ratio of expenditure to earnings compared with the previous year was in : 1921, 76.88 per cent. ; 1920, 71.36 per cent.

Earnings.—The earnings under several mainheads compared with 1920 were as follows :

	1921 florins	1920 florins	Increase Total florins	Increase Per cent.
Passengers and luggage	1,378,684	1,292,777	85,907	6.64
Goods	3,142,299	3,121,317	20,982	0.77
Other traffic receipts	939,220	791,254	147,966	18.70

Expenditure.—Comparative figures of expenditure under the following heads are :—

	1921 florins	1920 florins	Increase Total florins	Increase Per cent.
General charges	1,076,738	778,375	+298,363	38.33
Maintenance of way and works	745,529	575,100	+170,429	29.63
Maintenance of rolling stock and running expenses	1,642,088	1,613,457	+ 28,631	1.78
Traffic expenses	630,917	669,358	— 38,441	—
Electric power station	102,395	77,726	+ 24,669	31.75

IV. STATE TRAMWAY IN ATJEH

	1921 florins	1920 florins	Increase florins
Gross earnings	1,786,299	1,746,069	40,230
„ expenditure	1,981,709	1,862,065	119,644
Expenditure in excess of Earnings	195,410	115,996	79,414

Compared with 1920 there was an increase in earnings of 2.3 per cent. and an increase in expenditure of 6.24 per cent.

Per day kilometre the earnings and expenditure were :

	1921 florins	1920 florins
Gross earnings	9.57	9.33
„ expenditure	10.62	9.96

The ratio of expenditure to earnings compared with the previous year was : in 1921, 111 per cent. ; in 1920, 106 per cent.

Earnings.—The earnings under several mainheads, compared with 1920, were as follows :

	1921 florins	1920 florins	Increase Total florins	Increase Per cent.
Passengers and luggage	1,057,232	1,053,711	3,521	0.33
Goods	557,541	524,982	32,559	6.20
Other traffic receipts	171,526	167,376	4,150	2.50

Expenditure.—Comparative figures of expenditure under the following heads are :—

	1921 florins	1920 florins	Increase Total florins	Increase Per cent.
General charges	359,127	347,209	11,918	3.4
Maintenance of way and works	433,071	403,155	29,916	7.4
Maintenance of rolling stock and running expenses	881,408	841,064	40,344	4.8
Traffic expenses	308,103	270,636	37,467	13.8

VI. State Tramways in South Sumatra

	1921 florins	1920 florins	Increase florins
Gross earnings	2,125,712	1,499,536	626,176
„ expenditure	1,559,403	1,316,050	243,353
Earnings in excess of Expenditure	566,309	183,486	382,823

Compared with 1920 there was an increase in earnings of 42 per cent. and an increase in expenditure of 18 per cent.

Per day kilometre the earnings and expenditure were :

	1921 florins	1920 florins
Gross earnings	21.97	16.93
„ expenditure	16.12	14.86

The ratio of expenditure to earnings, compared with the previous year was: in 1921, 73.31 per cent.; in 1920, 87.77 per cent.

Earnings.—The earnings under several main heads, compared with 1920 were as follows :

	1921 florins	1920 florins	Increase Total florins	Increase Per cent.
Passengers and Luggage	588,547	542,787	45,760	8.43
Goods..	1,409,156	833,182	575,974	69.13
Other traffic receipts	128,009	123,567	4,442	3.6

The advance in the revenue of the Palembang line, compared with a previous year, was: in 1921, fl. 578,138; 1920, 256,875.

The greater advance is to be contributed to the increase of coal traffic, consequent upon a larger output of the state collieries at Bukit Assam. A comparison of recent years figures of the revenue on coal traffic is as follows: 1919, fl. 346,565; 1920, fl. 426,175; 1921, fl. 820,230.

The advance in the revenue of the Lampong line compared with a previous year was: in 1921, fl. 73,148; 1920, fl. 33,820.

The trade depression consequent upon the fall in price of pepper, rubber, coffee, etc., has disturbed the gradual development of the traffic of this line.

Expenditure.—Comparative figures of expenditure of both lines under the following heads are :—

	1921 florins	1920 florins	Increase Total florins	Increase Per cent.
General charges ..	260,713	282,569	— 21,856	--
Maintenance of way and works ..	373,186	262,857	+109,329	41.58
Maintenance of rolling stock and running expenses ..	728,866	574,521	+154,345	26.90
Traffic expenses ..	145,894	124,801	+ 21,093	16.90
Ferry service :				
Palembang - Kertapati and Road motor service Telokbeton-Tandjongkarang ..	50,744	71,301	— 20,557	—

3rd. Extension and New Works

§ 1. RECONNAISSANCE AND SURVEY

Java

The surveys of the following lines have been completed :— (*a*) Garoet-Tjikandjang, distance 32 km.; (*b*) Bandjaran-Pengalengan, 21 km.; (*c*) Kopo-Tjiwidei', 12 km.; commencement was made with the preparation of the construction : (*d*) Tandjongsari-Soemedang (lengthening of the tramway Rantjaekek-Tandjongsari), distance for adhesive railway: 21 km. and for rack railway: 17½ km. An examination of a route for electric tractive power has been commenced. (*e*) An aerial ropeway from the Kawapoetih volcano to Tjiwidei, distance, 8 km.

Because of financial reasons, the examination of routes connecting the west part of the provinces of the Preanger Regencies and Bantam and the terminals Tangerang to Serang has been stopped. A survey of a line Soebang-Pegadenbaroe-Pamanoekan, 37, km., was commenced. The municipality of Bandoeng has commenced a study of the tramway problem on the plain of Bandoeng. The working out of a reconnaissance of an extension of the tramway system on the plain of Djember and an investigation into operation of road motor services in the province of Banjoemas is in progress.

Sumatra, Borneo, Celebes, Bali and Lombok

In progress are: (*a*) the survey of the line Lahat to Djambi in South Sumatra; (*b*) examination of the traffic problem in the province of Benkoelen; (*c*) a new examination of the tramway problem in the isles of Lombok and Bali; (*d*) the survey of the line Batangtoroe to Padangsidempoean, distance 28 kilometers. The reconnaissance in the gorge of the Kwantan river has been stopped. The report of the reconnaissance of the railway connection in central Sumatra and the connection between the lines of the west coast with the South Sumatra system and the survey of a line, Sibolga to Batangtoroe, distance 49 kilometres in the province of Tapanoeli is completed. A reconnaissance in the province South and East districts of Borneo, for examination into the possibility of transport of iron ore from the Soengeidoewa district to the coast is being made.

§ 2. CONSTRUCTION

All the following tramways have standard gauge (1,067 millimetres).

1. *Bandjar-Kalipoetjang-Tjidjoelang Tramway* (part of the East Preanger tramway system).—This tramway starts from Bandjar station on the mainline Bandoeng-Djokja and runs in a south easterly direction to Kalipoetjang on the Indian Ocean, a distance of 44 kilometres; and from Kalipoetjang in a westerly direction to Tjidjoelang, a distance of 39 kilometers. This tramway was opened for traffic as far as Kalipoetjang on 15th December, 1916 and the whole line on 1st June, 1921. The total expenditure amounted to fl. 9,619,162.

2. *Tramway Rogodjampi-Bentjoeloek.*—This tramway, which starts from Rogodjampi station on the mainline Kalisat-Banjoewangi, runs in southerly direction to Bentjoeloek, a distance of 42 kilometres, and was opened for traffic as far as Srono, 13 kilometres from Rogodjampi, on 26th October, 1921. The other portion of the line has not yet been opened for traffic but handed to the open line only. The total expenditure amounts to fl. 895,387.

3. *Tramways near Bandoeng.*—(*a*) Rantjaekek-Tandjongsari-Soemedang. This tramway starts from Rantjaêkêk station on the mainline Bandoeng-Djokja at a distance of 18 kilometres from Bandoeng and runs in a north-easterly direction to Tandjongsari, distance 12 kilometres. This section was opened for traffic on 13th February, 1921. The preliminary work of the construction of the line Tandjongsari-to Soemedang, distance 30 kilometres, has been stopped, because of the decision of the board of directors of the state railways to examine a less expensive route for electric tractive power. Total expenditure amounts to fl. 1,214,213.

(*b*) *Bandoeng* (*Karees station*)—*Bandjaran-Soreang, with connection Kiaratjondong-Karees.*—This tramway starts from Ban-

doeng and runs in a southerly direction, and was opened for traffic on 13th February, 1921. Distance 26 kilometres. The total expenditure amounts to fl. 579,246.

(c) *Soreang-Tjwidei.*—This line will be 12 kilometres long. The preliminary work has been completed. The acquisition of land can commence. The total expenditure amounts to fl. 94,135.

(d) *Tjiteureup-Madjalaja.*—This line was nearly completed on the end of the year. Total mileage is 17 kilometres. The total expenditure amounts to fl. 698,958.

4. *Tramway Toeloengagoeng-Trenggalek-Toegoe.*—This line starts from Toeloengagoeng station on the mainline Kertosono-Blitar and runs in a westerly direction to Tjampoerdarat, a distance of 14 kilometres. This section has been opened for traffic on 15th July, 1921. The construction of the section beyond Tjampoerdarat a distance of 35 kilometres is in progress. The total expenditure amounts to fl. 1,849,783.

5. *Tramways in South Sumatra.*—(a) *Lampong Palembang connection.*—From the Lampong line, which starts from Oosthaveh (Pandjang), already 102 kilometres, have been opened for traffic, viz.:

Pandjang-Tandjongkarang, 12 km., on 3rd August, 1914.
Tandjongkarang-Laboeanratoe, 5 km., on 1st March, 1915.
Laboeanratoe-Tegineng, 22 km., on 1st November, 1915.
Tegineng-Hadjipemanggilan, 24 km., on 1st February, 1917.
Hadjipemanggilan-Blambangan, 14 km., on 1st February, 1918.
Blambangan-Kottaboemi, 20 km., on 2nd January, 1921.
Branch line Telokbetong-Garoentang, 4 km., on 27th May, 1921.

Work on the second section is in progress. After the bridge over the Wai Rarem river near Kottaboemi had been completed, the laying of permanent way could be continued beyond Kottaboemi.

The following section of the Palembang line has been opened for traffic: Kertapati (Palembang)-Praboemoelih, 78 kilometres on 1st November, 1915. The work on the section Praboemoelih-Martapoera (128 kilometres) is in progress. Earthwork is completed to the 84th kilometre.

(b) *Praboemoelih-Moearaenim.*—This tramway starts from Praboemoelih on the mainline Palembang-Oosthaven and runs in westerly direction to Moearaenim, distance 74 kilometres. The section Praboemoelih to Goenoeng Megang (4.5 kilometres) has been opened for traffic on 1st December, 1916 and the section Goenoeng Megang-Moeara enim (29 kilometres) on 2nd April, 1917. The total expenditure on the lines (a) and (b) amounts to fl. 36,330,928 on 31st December, 1921.

(c) *Moeara enim-Tandjong.*—This tramway, 13 kilometres long, was opened for traffic on 1st September, 1919. Its principal object is to carry off the output of the state collieries at Bukitassam. The total expenditure on the construction amounts to fl. 852,817.

(d) *Moeara enim Lahat.*—The work is being executed by a contractor. The distance between terminals is 38 kilometres. The total expenditure amounts to fl. 1,683,783 on the end of 1921.

6. *Railroads and Tramways in West Sumatra.*—(a) *in the Province of Sumatra's West Coast.*—(1) *The Tramway Pajacombo to Limbanang*, distance 20 kilometres, starts at the terminus Pajacombo of the railway Emmahaven-Padang-Fort de Kock-Pajacombo and was opened for traffic on 19th June, 1921. The total expenditure amounts to fl. 650,587.

(2) The work on the line Moeara kalaban to Moearo, distance 26 kilometres, is in progress. The completion is urgent in view of the timber supply to the Sawaloento collieries. The expenditure till 31st December, 1921, amounts to fl. 1,077,381.

(b) *In the Province of Tapanoeli.*—The construction has been stopped, because of the reduced construction capital expenditure and the building of other lines being more urgent.

7. *Tramways in Celebes.*—(a) *Makassar-Takalar.*—This tramway starts from Makassar, the capital of the government of Celebes, and runs in southerly direction to Takalar, distance 45 kilometres. The construction is nearly completed.

(b) *Makassar-Maros-Tanete.*—The distance from Makassar to Maros is 29 kilometres and from Maros to Tanete it is 57 kilometres.

The survey and estimates have been completed. The acquisition of land is advanced to Maros. In view of reduced construction capital the construction is not yet commenced. The expenditure amounts to fl. 2,833 410.

§ 3. IMPROVEMENT AND EXTENSION

The most urgent works only have been continued.

At and near Batavia the following works were in progress or have been completed: The main building of the new Passarsenen station has been roofed: The connection Manggarai-Tanahabang has been nearly completed and can be handed to the open line in a short time. The earth work to the lines Batavia to Angkee and Antjol to Tirem has been completed. The approach roads and squares near the freight yard of Tanahabang are under construction. The freight yard at Batavia station was nearly completed. A portion of the goods shed was ready for use. The two stations Batavia-North and Batavia-South will be closed. A new station, of which the survey and estimate are completed, will be constructed. Before starting the construction the whole traffic has to be concentrated at the station Batavia-North so that the station Batavia-South can be demolished. To that effect the Station Batavia-North is undergoing an important alteration. The construction of the main building of the station of Tandjong Priok is nearly completed, the station yard is in progress. Railway tracks on the harbor grounds have been additioned. Between Antjol and Soengeitiram a fifth track has been laid in behalf of earth supply and later on for separate freight traffic. At Manggarai some houses for the staff were completed.

At and near Sourabaia the principal work done is: The bridge over the Kali (river) Pagirian is in progress. The reinforced concrete piles of the viaduct over the Passarbesar street are completed. The bridge over the Kali (river) Mas is in progress. The engine sheds with offices at Sidotoppo and Kali Mas are completed. The gravity marshalling yard at Sidotoppo is completed. The work on a new storehouse for munition on the ground of the royal navy is commenced.

The work done *at Bandoeng* was: The deviation of the rivers Bangkok and Beunjeung near the station yard of Tjikoedapateuh and the canal which had for be dredged for that purpose, are nearly completed. Several sidings and spurs are completed. The station at Kiaratjondong was handed to the transportation. The auxiliary station yard is in progress. The parallel track between Bandoeng and Andir are completed. The house on the grounds which has been acquired for a marshalling yard at Tjimindi has been accommodated for a boarding-house for government officers. The building of a storehouse for the ticket printing office is commenced. The approach roads to the freight yard at Tjirojom have been metalled.

§ 4. ELECTRICAL BRANCH

In view of the advanced construction of the waterpower stations a decision has been made with regard to the current system to apply to the sections Tandjong Priok-Batavia-Meester Cornelis and Meester Cornelis-Buitenzorg. It is decided to apply direct current of 1,500 volt. The survey and plans of the section Tandjong Priok to Meester Cornelis were completed, so that tenders could be invited for the delivery of sub-stations, conduits and rolling stock. The electric light installation of the new freight yard at Batavia is completed. The installation at Tandjong Priok is commenced.

Tin Mines of the N. E. I.

COMMERCIAL working of tin deposits takes place on the islands of Banka, Billiton, and Singkep, situated off the southeast coast of Sumatra. The total production of tin in the Dutch East Indies during 1920 amounted to 21,991 metric tons, a small increase over the output in 1913 (21,200 tons). The was all produced by the government mines at Banka (13,427 tons), the Billiton Tin Mining Maatschappij (7,956 tons), and the Singkep Tin Maatschappij (608 tons).

The production of the Banka mines, which are owned and operated by the government, under the direction of the department of government enterprises, is by far the most important factor in the industry, since it amounts to nearly 60 per cent. of the total production of the colony. The latest statistics available regarding the Banka workings, compared with immediately preceding years and with the pre-war year of 1913, are :

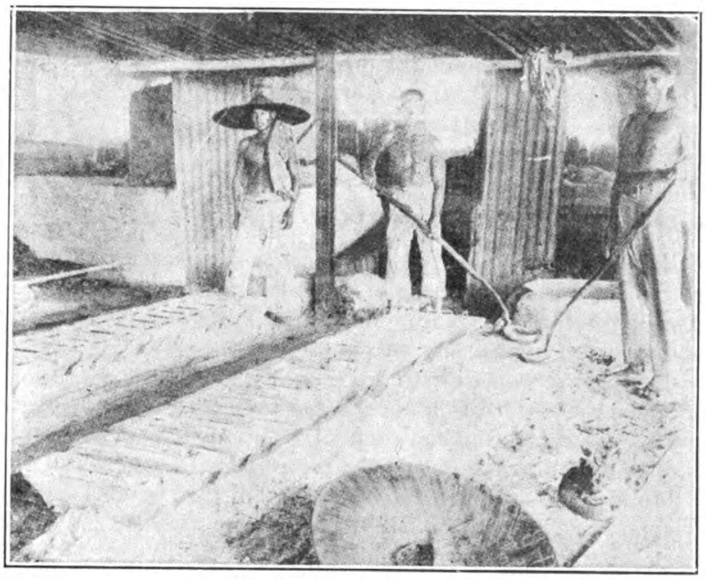
Item.	1913	1918	1919	1920
	Number.	*Number.*	*Number.*	*Number.*
Mines or pits	362	325	301	300
Average labor force	21,436	18,658	18,627	21,722
	Tons.	*Tons.*	*Tons.*	*Tons.*
Production	15,752	12,055	12,191	13,427
Tin auctioned in Holland ...	15,390	36	893	12
Tin sold in Dutch East Indies	—	10,934	15,047	9,326
Cost of production per picul, including freight and selling	*Florins.*	*Florins.*	*Florins.*	*Florins.*
charges	45	50	56	59
Average selling price per picul :				
In Holland	152	228	189	204
In Dutch East Indies ...	—	204	176	195
Net receipts	36,566,674	36,277,380	46,227,847	29,025,717
Net profits	25,219,074	25,803,489	*	*

* Not yet made public.

No statistics are yet available for 1921 except for the number of mines or pits, 293, and the average labor force, 21,273 persons. Net profits for 1919 and 1920 have not yet been declared.

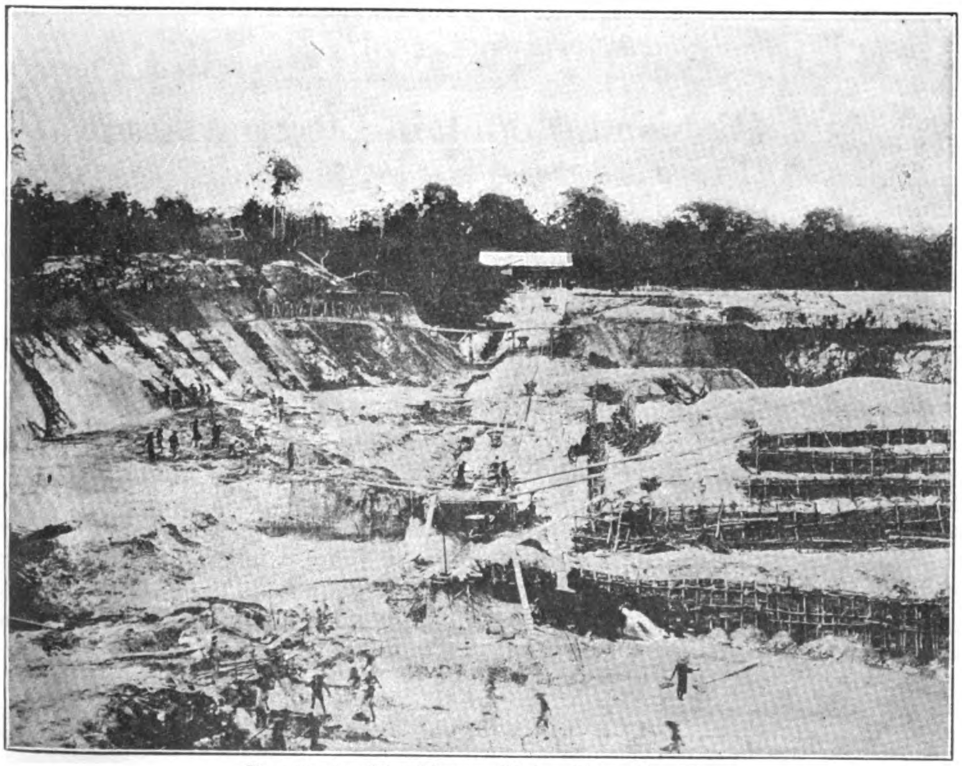
Banka Smelters—Maketing Government Tin

Contrary to what is done on Billiton, the tin of Banka is smelted on the island itself. Formerly each tin field had its own smelter, but during the last year smelting has been considerably centralized and at present there are reduction plants only at Blinjoe. Besides the vertical kiln, which is still being used for smelting the ore (the so-called Van Vlaanderen furnace), the flame furnace has lately been put into operation in Banka, through which the loss of tin will be greatly reduced. The tin of Banka is considered to range among the purest kind found ; a purity of 99.97 per cent. is guaranteed, which is, however, usually exceeded. There has long been an agitation to concentrate all the tin smelting activity at one place, especially that with reference to the Banka and Billiton outputs.



Tin Smelting at Banka

Before the war all of the government [Banka] tin was shipped by the Nederlandsche Handel Maatschappij and auctioned in Holland, no sales being effected in the colony, but since that time all sales are conducted direct by the government through its bureau voor verkoop, departement van gouvernementsbedrijven, at Weltevreden, Java. Low prices and a lack of demand have resulted in very large accumulations of tin stocks here and at Singapore, the total amount of which is difficult to estimate. A few months ago it was reported that the governments of the Federated Malay States and of Netherlands India had agreed to withhold stocks from the market until prices improved, or at least to limit the export to small quantities. It was also reported that the Banka and Billiton mines would be closed down pending an improvement in prices, but the latter report has not been confirmed.



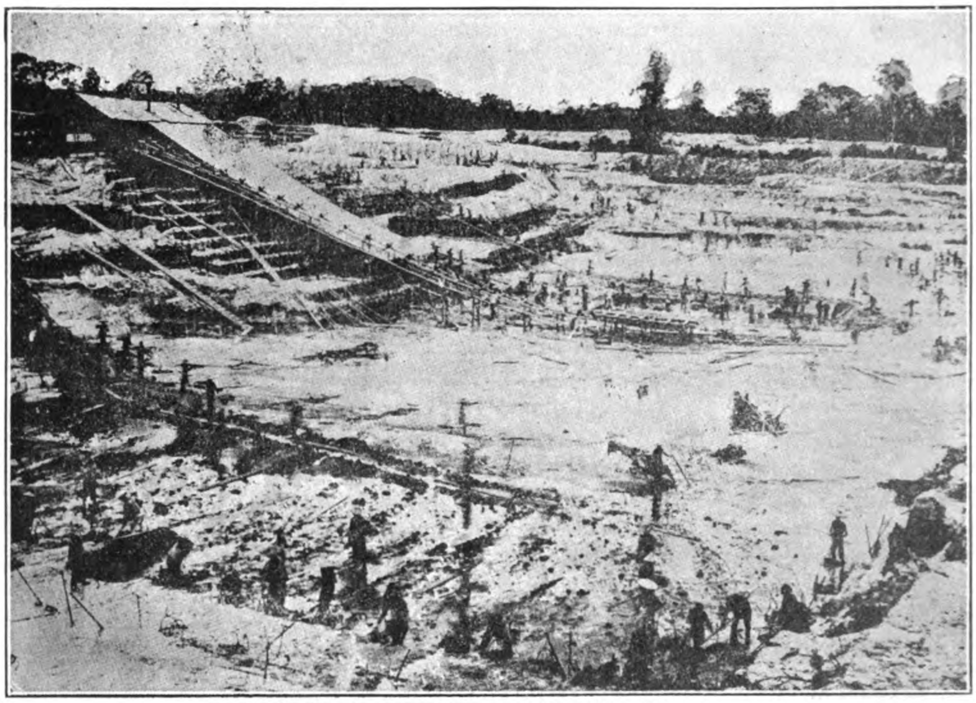
The Banka Tin Mines: Koba, Mine No. 35

The Billiton Mines

The tin deposits on the island of Billiton are operated by the Billiton Maatschappij under a concession obtained from the government in 1852 which in 1892 was extended for a period of 35 years, by virtue of which five-eighths of the net profits go to the colonial government in the form of a royalty. It is understood that the concession will not again be renewed by the government and that it definitely expires in 1927. It is generally believed that the government will continue the operation of the mines on its own behalf. The private interests controlling the Billiton

Maatschappij have formed in Holland a new company called the Stannum Mining Co. with a capital of 500,000 florins (florin at par= $0.402) for the purpose of taking over the machinery and equipment owned by the old company, probably with a view to operating in some other field after 1927.

The work is done by Chinese coolies under contract, the average number of laborers in 1920 being 18,000. In 1914 there were 47 mines or pits being worked, and in 1918 only 30. Production in 1913 amounted to 4,453 metric tons, in 1917 to 6,492 tons, in 1918 to 6,945 tons, in 1919 to 7,325 tons, and in 1920 to 7,956 tons. Electrical equipment has been installed for the working of the ore, the largest installation being at Manggar. The motive power at this station is furnished by six Diesel motors of 1,200 horse-power each.



The Banka Tin Mines: Koba, Mine No. 38

The Singkep Mines—Exports from Java

The Singkep Tin Co. received its concession from the government in 1889. Besides the ore found on the island, important deposits were discovered under the sea close to land. These deposits are worked with dredgers, the mud being put through a preliminary concentration aboard and then further concentrated on shore. All of the Singkep production is smelted at Singapore. Production in 1913 amounted to 672 metric tons, in 1917 to 770 tons, in 1918 to 514 tons, in 1919 to 717 tons, and in 1920 to 608 tons.

Exports of tin from the island of Java (in metric tons) during the past three years were as follows:

Countries of destination.	1919	1920	1921
	Tons.	*Tons.*	*Tons.*
Netherlands	7,032	7,029	5,152
Great Britain	2,570	4,205	6,378
Germany	—	14	387
France	415	105	303
Japan	880	695	1,177
All other	5,355	1,600	142
Total	16,252	13,648	13,539

Mining in Siam

TIN and wolfram are the only metallic ores which figure in Siam's exports. Gold mining has been attempted, and rich deposits of lead and silver have been reported in north Siam, but the inaccessibility of the mining land has made the development slow. The sapphires which are named in the customs report (Tcs 2,569,762 in 1920-21) are mined by Shans at Pai-lin, French Indo-China, formerly Siamese territory, and are exported through Bangkok.

Modern tin mines are entirely in the hands of foreigners. Australian capital controls most of the tin workings, although some English, and a small amount of French and Danish, money is invested in tin. Chinese work numerous open-pit mines by hand but their operations are so irregular and their mines vary from two women panning ore in a creek to an organization employing a hundred coolies, that it is difficult to keep track of them.

The Siam Coal Mining Company, Ltd., which is about to begin operations at Bandon, Southern Siam, is the first all-Siamese mining company to undertake large scale workings.

Practically all tin ore mined in Siam is smelted at Penang.

Tin is produced in five provinces in Siam, viz., Puket, Surashtra, Nakon Sri, and Patani. Puket has always produced more than all the other provinces combined. For the year ending March 31, 1921, the figures were as follows: Puket, 87,605 piculs; Nakon Sri, 9,417 piculs; Patani, 6,186 piculs; Surashtra, 974 piculs. Nakon Sri also produced 1,936 piculs of wolfram ore at an average price of $32.92.

The figures for the output of the last five years follow:

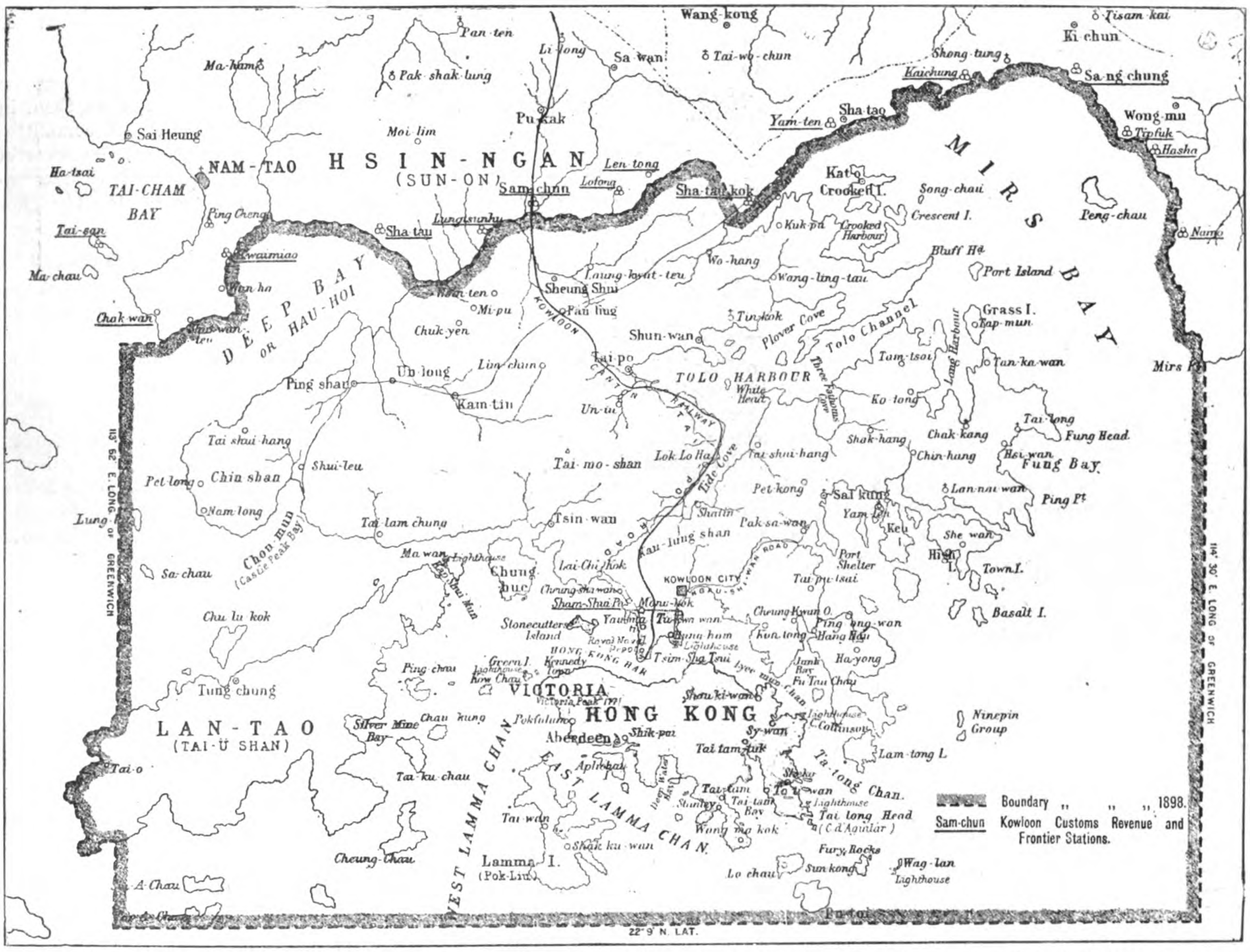
Year Ending March 31	Tin Obtained from Dredging.	Tin Obtained from Other Sources.	Total	Average Price in Straits Dollars Per Picul
	Piculs	Piculs	Piculs	
1917 ..	47,298	99,961	147,259	89.00
1918 ..	51,343	102,439	153,782	22.00
1919 ..	52,124	96,301	148,425	147.84
1920 ..	74,993	68,513	143;506	148.30
1921 ..	59,013	45,170	104,183	129.95

TIN PRODUCTION BY PROVINCES IN 1922.

	April	May	Average Price	April	May
Patani	681	670			
Nakon Sri ..	918	1,084	Tin	$76.90	76.47
Puket	6,560	6,593	Wolfram	11.33	14.20
Piculs..	8,159	8,347			

Diamond Mountain Electric Tramway

The Diamond Mountain Electric Railway Company is steadily pushing on construction work and the laying of track will be begun between Cholwon on the Seoul-Wonsan line and Kimwha, a distance of 18 miles, early next spring. The same Company has also obtained official permission to supply electricity to Seoul and Koyang district, and it is expected that the supply will be started by September of next year, when the electric railway traversing the district will possibly be opened to traffic. The Company has a nominal capital of five million *yen* and has the far larger portion of it still to be called for. In view of the present stringency of the money market the Company is apparently hesitating to call for further payment, and it is interesting to note that Dr. T. Kume, president, has recently sold his very fine property in Yoyogi, suburb of Tokyo, to Marquis Y. Tokugawa for two million *yen* with a view to investing the entire proceeds of the sale in the enterprise of his Company. It appears that the courage and firm determination of Dr. Kume accounts for the progress made by work the Diamond Mountain Railway Company as contrasted with the tardy, or rather lack of, progress made by certain other light railways organized about the same time, that is, when the war boom was at its height.



Map of Hongkong and the British Leased Territory of Kowloon showing Taimoshan and the Shing Mun River with outlet at Tide Cove, which it is proposed to impound and pipe the water down to Kowloon Point and thence by submerged mains across the Harbor to Hongkong

Great Waterworks Scheme for Hongkong

Water from Taimoshan Mountain

IN a leading article on the water shortage, the Hongkong *Daily Press* suggested that a solution of present difficulties would be found by "looking ahead and drawing the principal supplies for the whole colony from the mainland, and from the hinterland of the peninsula rather than from areas which may, within a century, be required for business or residential purposes." We have since gleaned information, says the *Daily Press* in a subsequent article, as to proposals now under consideration by the government for vastly increasing the water supplies of the colony and, whether they are adopted in their entirety or not, they undoubtedly show that the government's advisers are quite ready to take long views and to consider the requirements not of a decade or even a generation but of many years to come.

The chief proposal before the government does the very thing the *Daily Press* suggested ; it taps the hinterland of the peninsula in a way that would put a very considerable supply of water at the disposal of the colony. The scheme has been in preparation in the public works department for a very long time. Plans have been prepared by the executive engineer of the waterworks, Mr. R. M. Henderson, for collecting water for both Hongkong and Kowloon from Taimoshan mountain. The southern slopes have been selected as the catchment area and the large stream which at present finds its way to the sea at Shatin will be impounded. This stream has an average dry weather flow of over one and a half million gallons a day. In the Shing Mun valley two reservoirs, each with a capacity of about 1,000 million gallons, will be constructed.

A portion of the catchment area slopes away from the reservoir but by means of a catchwater this gathering ground, and the product of another fair sized stream, will be added to the scheme.

The catchment area can be still further enlarged when required by extending catchwaters to include other slopes of the mountain. Enormous volumes of water would thus be drawn upon.

Submerged Main Under the Harbor

From the two great reservoirs water would be brought down by conduit, and in some parts by tunnel, to a point very near the existing Kowloon filter beds. Supplies would be taken off for

Kowloon waterworks when that supply needed replenishment, and the remainder would be brought by iron mains to the harbor frontage at Kowloon point. The scheme proposes to bring the water across the harbor by a submerged main and a supply at good pressure can then be made to the lowest districts of the city of Victoria. It will be readily understood that there are difficult problems connected with laying a main beneath the harbor. A recent number of an engineering journal gave an account of damage done to such a pipe beneath New York harbor by the operations of a dredger. Important questions as to the length of life and replacement cost of such a pipe will also have to be considered.

Tunneling Through Hills

A scheme of the magnitude of the one here briefly outlined will of course take years to complete. Some portions of the operations are likely to be more difficult than others and to take a considerable time. Tunneling through intervening hills, when the water conduit is being constructed will be a very arduous business. But, since the course of the channel will be known, the tunneling can be begun at the first possible moment. It is bound to be a slow business since only a limited number of people can work at the face of a tunnel, and obtaining additional faces by sinking intervening shafts would greatly add to the cost of the work.

Providing for Immediate Needs

The proposals now before the government also provide for more immediate necessities. It is proposed that *pari passu*—as the lawyers say—with the large scheme just outlined, extensions shall be made at Kowloon reservoir and additional catchment areas brought into service on the island of Hongkong. So great is the increase in population and the demand upon the water supplies that, if extensions of existing undertakings were not put in hand the demand would greatly exceed the supply long before the Taimoshan scheme was completed. If the big scheme is put in hand, however, the extensions of existing works can be framed on relatively less expensive lines. It is proposed to provide an additional reservoir at Kowloon, as it will be possible to construct one to contain 100 million gallons or thereabouts, at a comparatively moderate cost. An extension of the catchment area will also the made there.

On the island, another 2,600 acres can be added to the catchment area of the Taitam-Wongneichong chain of reservoirs. Some idea of the additional quantity of water that would find its way to the reservoir may be gathered from the fact that one inch of rain over such an area would represent about 60 million gallons, and any springs or streams within the area would be additional. According to the report of the committee which recently considered the feasibility of extending the water carriage system, the inclusion of this 2,600 acres would increase the supply at Taitam (without further reservoirs) from its present figure of 7 millions to 10 millions a day. " The Kowloon Works," this report states, " will produce 1.7 million gallons a day in the driest recorded year and can be considerably extended at a comparatively small cost. The present supply is about 1.7 million gallons a day."

Estimates of Future Requirements

These figures give the clue to the need for extension of the colony's water supplies. The percentage of increase in consumption in Hongkong in 1921, compared with 1912 was over 72 per cent, and in Kowloon 69 per cent. But a considerable proportion of this increase accrued in the last three years of the period. If the years 1918 to 1921 are taken, the percentage increase of consumption for Hongkong is 29 per cent. and for Kowloon nearly 36 per cent. If the rate of increase of consumption of those three years continue, the daily consumption in 1924 would be: in Hongkong, over 10 million gallons a day—an aggregate increase of 900 million gallons; and in Kowloon, nearly 2½ million gallons—or an aggregate annual increase of nearly 250 million gallons per annum.

In other words, the demand of Hongkong in 1924 if the increase of consumption is not checked is expected to be, even then, in excess of the 10 million gallons a day that the recent committee said the island waterworks would provide if the 2,600 acres of additional catchments were all in full operation. Hence the necessity for the Shing Mun valley scheme and for the pipe line across the harbor.

As for Kowloon, the 2½ million gallons a day which the district is estimated to need in 1924 will not be fully met by the extensions proposed, and Kowloon, also, will draw largely upon the Shing Mun scheme for supplies, as soon as they are available. If meters are introduced in the meantime, some reduction in the demand may result, but too much must not be expected on this account as the extraordinarily rapid development of the colony makes much of the increased demand inevitable.

It is too early yet to give any estimate of the cost of the schemes proposed. The sum is bound to run into many millions of dollars but ultimately the colony may expect to have the ample water supplies necessary for public use and for maintaining the water service to the port.

Cost of Building in the Straits Settlements

MR. J. H. W. Park, colonial engineer, writes as follows in his annual report:—

In the 1919 report my predecessor gave some interesting figures in regard to recent changes in prices of labor and materials. Such figures, however useful, do not convey to the mind the effect they have on construction of public works. I have recently had tables compiled showing the cost of similar works or buildings in the various settlements during the last three years. It is not possible to refer to these in detail but a single instance will suffice.

The cost of building a first-class quarter in Singapore containing 6,000 square feet of floor space, 1,125 square feet of outbuilding and 150 feet of covered way complete with water, electric light, tennis court, road and fence but not including land, sewers or piled foundations, was in May, 1919, actually $21,256; in August, 1920, this cost became $57,619; while in May, 1921, it was $38,846. These figures are from accepted tenders.

When it is remembered that public works officers have as a rule to prepare estimates between June and October for works to be undertaken probably between March and September of the following year their difficulties in the face of the variations in price thus disclosed are obvious. Actually for 1920 they provided $21,000 per house while for 1921 there was allowed $41,250.

I judge 1919 building prices to have been 20 per cent. on the average above those of 1916 while those of 1920 were 150 per cent. and those of 1921 about 75 per cent. above the corresponding ones of the same year. On these figures the building program of 1919 was double that of 1916 while that of 1921 was four times greater than that of the same year.

It is possible to apply somewhat similar reasoning to roads where prices are mainly dependent on local labor and it is not difficult to deduce therefrom that road work has probably increased about 75 per cent.

These considerations show very clearly how the duties of individual members of the department have been added to in recent years.

Liuchang Coal Mines

THE Liuchang coal mines are located about 13 miles north of Chinwangtao and connected with the port by a 30-in. narrow gauge railway. These mines have a daily output of 400-500 tons, mined from two inclined and one vertical shaft. The two inclined shafts are each equipped with a 40 H.P. hoisting engines. There is also two ventilating shafts and one auxiliary shaft with a small winch.

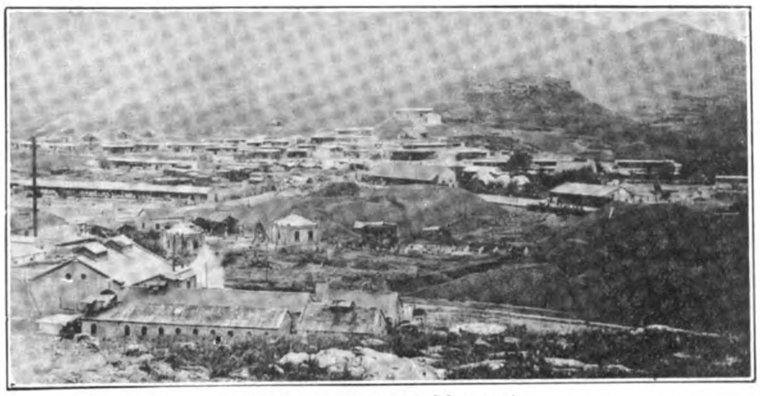
The machine shop is equipped with a 15 H.P. engine, lathes and other machine tools to take care of repairs. A model-making room, blacksmith shop, foundry and fitting room round out the shops. The battery of boilers of the Lancashire type, produce 450 H.P., while a 10 kw. set lights the mines.

In the mines are two stage pumping plants that take care of the two 8-in. pipe lines. In addition, there are two five-inch pipe lines connected to steam pumps, which are to be replaced in the near future by electrically driven pumps.

The railroad equipment consists of three 10-ton Vulcan locomotives, one 20-ton Baldwin locomotive with tender and one 20-ton Borsig locomotive on order and which is expected to arrive shortly. Forty-four 4-ton steel coal cars and twenty 10-ton wooden coal cars complete the rolling stock. The mine cars consist of 100 wooden and 125 steel coal cars. The railroad bridges are of the trestle type, most of which are of reinforced concrete, of which material, some of the culverts are also made.

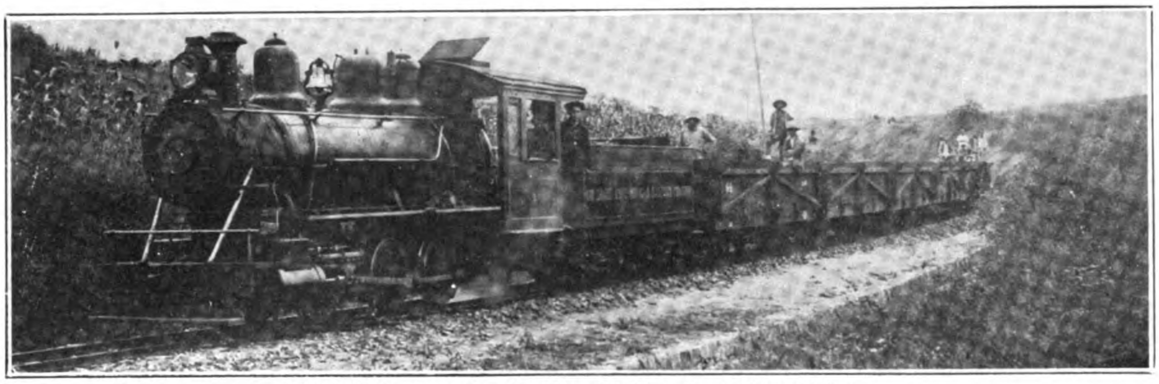
The head office of the company is located in Shanghai, It is capitalized at $1,440,000. of which $1,000,000 has been paid up.

View from East Mountain

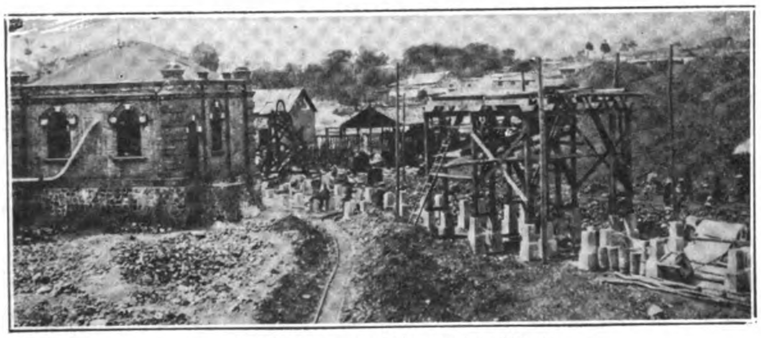


View from South Mountain

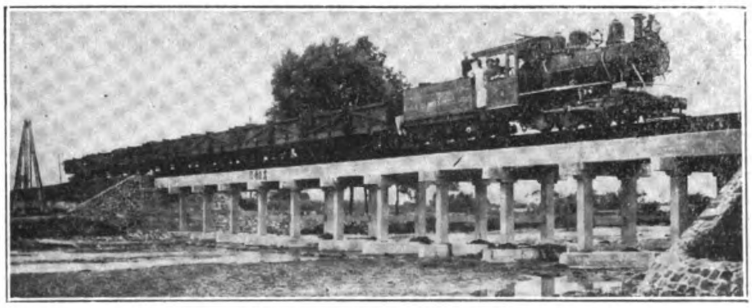
LIUCHANG COAL MINES, 1922



Baldwin Locomotive Hauling Coal Train of Koppel Cars



Inclined Shafts and Screening Plant



Reinforced Concrete Trestle Bridge at Kouchang

South Vertical Shaft

The Master American Builder in Japan

The Work of the George A. Fuller Company of the Orient, Ltd.

JAPAN emerged from the war with a last amount of world trade at her door and an acute shortage of buildings to house her increased business. For the last two years her representative have been studying the building methods of Europe and America and they have decided that the made in America business buildings are superior to all others and thus about seventy years after Commodore Perry of the United States navy opened up the ports of Japan to American commerce the Nippon kingdom is opening its doors to the best brains of the United States in the business of erecting monuments of steel, concrete and granite dedicated to the god of business and trade.

The honor thus conferred on the United States was actually unsought. For many months the Japanese were in the United States canvassing the field and finally decided on a prominent New York firm of builders as being best qualified to organize the business of putting up American business buildings in Tokio and other big cities in Japan. The concern selected was the George A. Fuller Company.

If the Japanese had entered the offices of the Fuller Company merely to award a contract or so for the construction of modern office and business buildings in Tokio it is likely that they might still be looking for some one to accept those contracts as it has been a more or less well defined policy of the company to centre its attentions on building operations in the United States rather than in foreign lands.

The New Home of the Great Mitsubishi Company of Tokyo, the largest Office Building in Asia

But the Japanese came to the company seeking help instead of bearing gifts in the form of contracts. Their commissioners made plain at the outset that they wanted the American builders to go to Japan and teach the Japanese the best and most modern methods of building in order that Japan might start on her campaign of modernizing her great cities at the present point of efficiency and perfection reached by the American builders. They signified their desire that the Americans should go to Tokio not merely as

builders but as teachers to train and educate the Japanese architects and engineers in the school of modern American construction methods.

This modern Macedonian call, according to the Fuller Company officials, could not easily be ignored. Arrangement to take over a complete American organization to Tokio, therefore, were made. The organization was called the George A. Fuller Company of the Orient, Ltd. Many prominent Japanese business men, architects and contractors are interested in the concern. Baron Shibusawa, a member of the recent peace commission, and Baron Kondo are among the directors.

"As far as fundamental methods are concerned," say the officials of the George A. Fuller Company, "the buildings which the the Orient, Ltd., are completing in Tokio differ little from those which the Fuller Company has been erecting in the United States during the last few months. Of course, the prevalence of earthquake troubles, although not always violent, necessitate the use of much heavier steel parts. Each of these structures forms as near as is practicable a modern American fireproof type of office building and at the same time keeps them in conformity with the customs and laws of Japan. The building law of Tokio limits the heights of all structures to 100 feet from grade to top cornice. All

Magnificent New Head Office Building of the Nippon Yusen Kaisha, whose Steamers carry the Flag of the Rising Sun on all the Important Trade Routes of the World

This is the first real step to Americanize the construction and building business of Nippon. According to the officials of the Fuller Company, the Japanese are exceedingly adaptable to the task of assimilating the American methods. They seem to display practically no desire to cling to tradition in architectural motifs or engineering methods.

The organization which the Fuller Company took to Tokio included several Japanese who had studied building methods in New York and other American cities. Since it reached Tokio it has taken on a large number of Japanese architects and engineers who are students of every engineering job. In fact, the operations, now going on in Tokio, are schools for native Japanese engineers and architects throughout the empire.

the structural steel work was designed, fabricated and shipped from the United States."

Marunouchi Building

The largest operation on which the Company is engaged is the Marunouchi building, owned by the Mitsubishi Goshi Kaisha in the Marunouchi district. It is to be used exclusively as an office structure, is the largest structure of its kind in Asia, as it covers a plot measuring 300 by 350 feet, is eight stories high and is of structural steel with reinforced concrete arches and cement floors.

The exterior of the structure consists of a granite base succeeded by a story of architectural terra cotta and above that by six stories

of brick work faced with the Japanese type of finishing tile, which comprises the shaft of the building. The remaining story tops the building and is made of cement stucco work. The architect is Dr. Kotaro Sakurai. The cost of the structure will be approximately $5,000,000. It will be completed in December, 1922.

Area : Basement	.. ..	77,864 sq. ft.
First floor	.. ..	77,864 ,, ,,
Second floor	.. ..	72,792 ,, ,,
3, 4, 5, 6, 7 and 8th floors	.. .. ..	436,652 ,, ,,
Ninth floor	.. ..	12,544 ,, ,,
Total	.. ..	677,716 sq. ft.
9 stories : Tsubos	.. ..	18,825

The main cornice is of ornamental reinforced concrete. The parapet over the main cornice is of reinforced concrete faced with ornamental artificial stone.

The interior partitions are of solid brick, hollow brick reinforced with steel, reinforced concrete, hollow terra cotta tile reinforced with steel and steel studs with metal lath and cement plaster.

General Features: Basement.—Boiler room; coal room; kitchen; café and dining room; store rooms; motor generator room; transformer room; pump room; battery room.

First Floor.—Stores opening on all four elevators. Two passage-ways or arcades—one running north and south, the other east and west, intersecting at the centre of the building. Both sides of arcades lined with stores. Elevators open to large elevator

Seven Story Structure Erected for the Japan Oil Company in Tokyo

General Construction.—Foundation composed of American wood piles 45-ft. to 55-ft. in length with heavy caps or footings of reinforced concrete. Superstructure is of steel skeleton frame throughout, with reinforced concrete floors and all steel protected from fire and dampness with reinforced concrete covering.

Exterior walls at the first floor are constructed on heavy brick-work faced with granite and artificial stone. The exterior walls from the second to the seventh floors inclusive are constructed of heavy brick and reinforced concrete faced with a light buff colored facing tile. The walls at the eighth floor are faced with ornamental cast stone and backed up with brickwork and reinforced concrete.

lobbies. Arcades and elevator lobbies finished with marble walls, ornamental plaster ceilings and heavy tile floors.

Second to Ninth Floors, inclusive, are for general offices to be rented. All offices to have linoleum floors on cement with white plastered walls and ceilings. All offices are outside rooms. Toilet rooms are provided on each floor equipped with high-grade American-made white enamelled toilet fixtures. These rooms have walls of glazed tile and terrazzo floors.

Mechanical.—Two septic tanks; ten passenger elevators; One freight elevator (electrically operated); steam-heating plant in basement with radiators in each office; mail chutes; motor

generator sets; pumping plant for water supply; complete electric light and power system; telephone system, all offices; kitchen and cooking equipment; dining and service rooms; gas supply where desired.

Building started, November, 1920. Completed, December, 1922.

Japan Oil Building

The Japan Oil Company building, which is being erected for the Japan Oil Company, Ltd., Tokio, Japan, is a seven story office building of steel skeleton construction, with reinforced floor arches and cement floors. Sone & Chujo are the architects. The cost is approximately $1,500,000 and the date of completion June 15, 1922.

Area: Basement	26,565 sq. ft.
First floor	26,565 „ „
Second floor	23,541 „ „
3, 4, 5, 6 and 7th floors	117,705 „ „
Total	194,376 sq. ft.
7 *Stories and Basement*: Tsubos	5,400

Construction.—American wood piles, 45-ft. and 50-ft. long, capped with heavy reinforced concrete footings supporting the skeleton steel frame. Steel frame fabricated in and shipped from the United States. Floors of steel beams and reinforced concrete. Exterior covering consists of granite base courses with *tsukide* stone to the level of the third floor. Remainder of exterior walls are of American architectural glazed terra cotta backed with solid and hollow brick. Roof is of felt and gravel with sheet copper flashings. Interior partitions are of reinforced concrete and hard burned hollow terra cotta blocks.

Features

Basement.—Steam-heating plant. Garage, 36-ft. by 56-ft.; kitchen and service rooms; barber shop; dining rooms; motor generator and pump rooms; store rooms.

First Floor.—Two main entrances furnished in marble, terrazzo and ornamental plaster. Large grand hall in marble, terrazzo and ornamental plaster, with solid marble grand stairs and bronze ornamental balustrade and ornaments.

Two large banking rooms (Sumitomo and Mitsui) equipped with reinforced concrete vaults and Mosler steel combination vault doors.

Telephone room with three booths, post office, two stories cigar and news stand.

Second Floor.—Three banking rooms and miscellaneous service rooms.

3rd, 4th and 5th Floors.—General offices—rented. Linoleum floors on cement, white plaster walls and ceilings. Tiled walled toilet rooms on each floor with enamelled Japanese style and American fixtures. All offices with windows opening to daylight.

6th and 7th Floors.—General and executive offices of the Japan Oil Company. Same general features and conveniences as other floors.

Mechanical.—Septic tank; 4 passenger elevators; 1 freight (electrically operated); Steam-heating plant with radiators in all offices; modern system of toilet fixtures and plumbing installation; motor generator sets; complete telephone system; mail chute; All electric wiring enclosed in steel conduits and wiring installed after conduit work has been completed; 68 offices—but entire building not yet subdivided.

Building started, October, 1920. Completed, August, 1922.

Yusen Building

The next building is also an office structure for the Nippon Yusen Kaisha (Japan Mail Steamship Company), also in the Marunouchi district of Tokio. The site is approximately 160 feet by 300 feet and the structure seven stories high. The building is also of structural steel, skeleton type, with reinforced concrete flat arches, cement floors and architectural terra cotta exterior over a granite base. The architects are Sone & Chujo. The cost of the building is approximately $3,000,000, heating, plumbing, ventilating and electric materials, mail chutes, copper and kalamein iron fireproof, doors, jambs and it is expected that it will be ready for occupancy in December.

Net Area: Basement	44,352 sq. ft.
First floor	44,352 „ „
Second floor	35,904 „ „
3, 4, 5, 6 and 7th floors	179,520 „ „
Total	304,128 sq. ft.
7 *Floors and Basement*: Tsubos	8,450

Construction.—American wood pile foundations with heavy concrete caps and footings, supporting the structural steel skeleton frame. Floor construction throughout is composed of steel bearing beams and girders which support the reinforced concrete floor slabs. All steel throughout encased and fireproofed with reinforced concrete.

Exterior facing at the first floor of the north-east and west elevations are of granite, supporting American-made architectural glazed terra cotta. This terra cotta continues to the parapet above the main roof. The terra cotta is backed with solid brick with the four inch inner face laid up with hollow brick, to exclude the presence of dampness.

The entire south elevation is laid up in solid brickwork which is covered on the exterior with cement stucco laid off and jointed to represent stone courses. The interior partitions are constructed of reinforced concrete, hollow fireproof tile reinforced with mesh and steel channel and metal lath, all finished in white plaster. The roofing material consists of felt and gravel with certain portions covered with a vitreous tile laid in asphalt.

General Layout.—The basement is occupied by the boiler room, printing room, store rooms, garage, 24-ft. by 66-ft., offices and miscellaneous coal and other rooms containing mechanical equipment.

First Floor.—Passenger department; finance division; supplies division; shareholders registry offices; accounting department; public lobby.

Second Floor.—General Executive Offices.

3rd, 4th, 5th and 6th Floors.—Rentable office space.

Seventh Floor.—Large assembly hall, dining room, kitchen.

Mechanical Features.—Six passenger, one freight and one service elevator, all electrically operated; septic tanks; steam-heating plant; garbage disposal system; motor generator sets; modern toilet rooms, equipped with high-grade white procelain fixtures; complete telephone system; latest American kitchen ranges and appliances; complete equipped service and dining rooms; mail chute; electric lights throughout.

General.—Main entrances: marble wainscot, ornamental plaster cornices, marble and terrazzo floors. All woodwork in first floor will be teak. Upper floors will have cement flooring covered with linoleum. Walls and ceilings finished in white plaster. All woodwork to be of oak finished with varnish. American hardware used throughout—solid bronze. Building absolutely fireproof.

Building started, November, 1920. Completed, December, 1922.

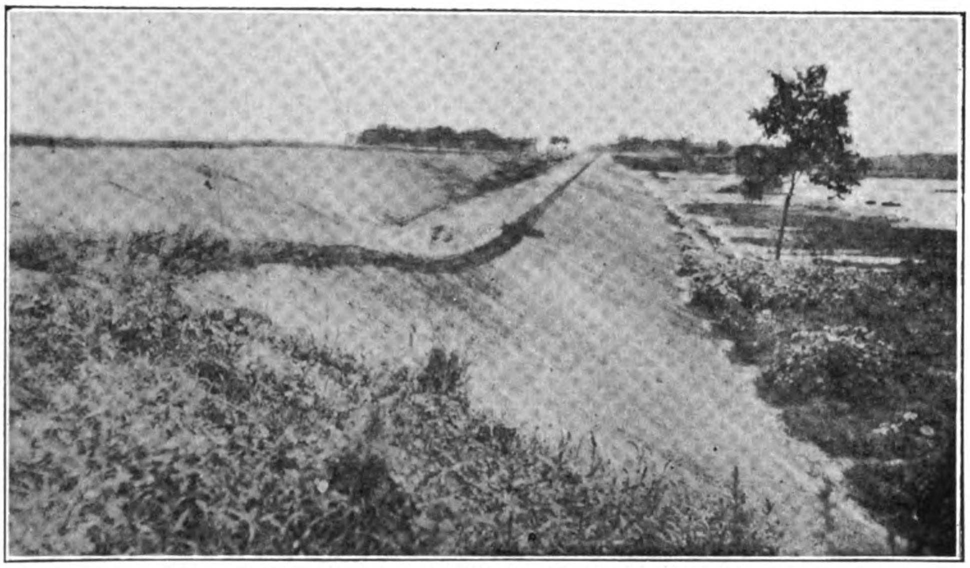
The smallest structure is the Crescent building, Kobe, Japan: owners. Brunner, Mond & Co. (Japan), Ltd. The size is 90 feet square and it is six stories in height. It is an office building of reinforced concrete, flat arch construction and terra cotta front. The approximate cost will be $300,000. The company acted in the combined capacity of engineers, architects and contractors for the building.

Among the many additional materials and trim, polished plate and wire glass, sash chain and fixture, wire cloth reinforcing material, kitchen, equipment, vault doors, finishing hardware, directory boards and linoleum.

The Han River and Its Levees

By H. S. Chuck, A.B., C.E., A.M. Am. Soc. E.C., M.A.C.A.E.

WATERWAYS, including rivers and canals, form one of the most important group of assets contributory to the wealth and progress of a nation. They serve as the common means for the transportation of the produce from the producers to the consumers, thereby linking the inland commerce with that of the outer world. Being essentially an agricultural nation, China should look more to her waterways as the cheap and quick means for the transportation of her agricultural products. She is blessed with large rivers which she may develop to their full advantage to accomplish her ends—the Yellow river feeding the north; the Yangtze river, the central portion; and the Pearl river, the south. But it is regrettable to mention that, in recent years, so very little or no attention at all has been given to their improvement, whereby such results could be effected.



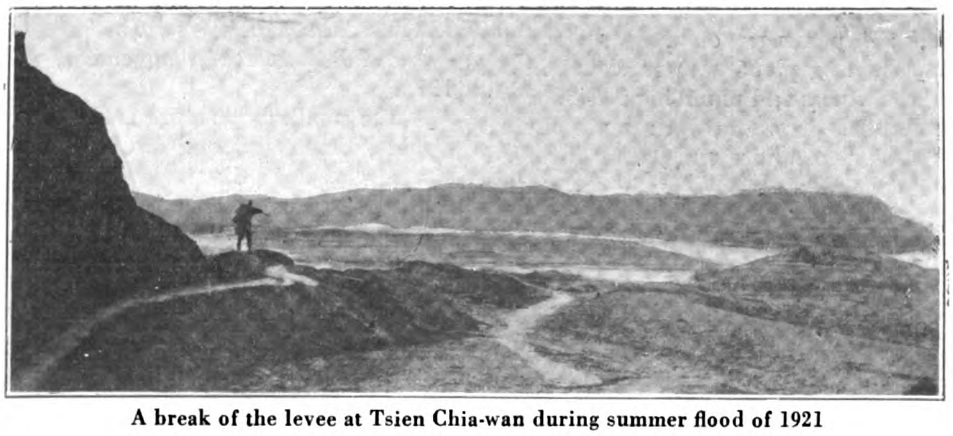
New levee constructed by the International Famine Relief Committee during spring of 1922, showing banquette of levee on land side

Historically, China, by no means, can be said to be backward in the development and improvement of her water courses. The grand canal is a gigantic engineering scheme. She had at one time in her history an emperor who did so much good work towards the conserving of rivers that he is now made a god.

Through the opportunity given me by the China international famine relief commission, committee for Hupeh, as the chief engineer, to take charge of all the levee construction and repairs along the various points of the Han river, from Hankow to Siang Yang, during the spring of 1922, I had the fortune to avail myself of the opportunity to become acquainted with the general conditions and the general characteristics and phenomena of the lower part of the Han. It is upon the knowledge which I thus gained during this short period that the following information is based.

General Description of the Han River

The Han river rises from its source in the province of Shensi, in the mountains forming the provincial boundary between the province of Szechuan and Shensi as well as the water shed between the Han river and both the Yellow and Yangtze river systems, these mountains surround a large plain, known sometimes as the Han Chung plain. For about fifty miles, the Han river flows through this plain. Then it enters into a mountainous district of about three hundred and fifty miles long. In this mountainous district, the bed of the river is rocky. The channel is narrow, obstructed by numerous bad rapids, and, at some stretches, confined by gorges. From the neighborhood of the town Yun Yang, which is about half-way between the source and the mouth of this river, the country downwards become less hilly. The country of the lower half of the Han river is generally flat. Being almost entirely of an alluvial nature, it differs entirely in characteristics from the upper portion of the Han river.



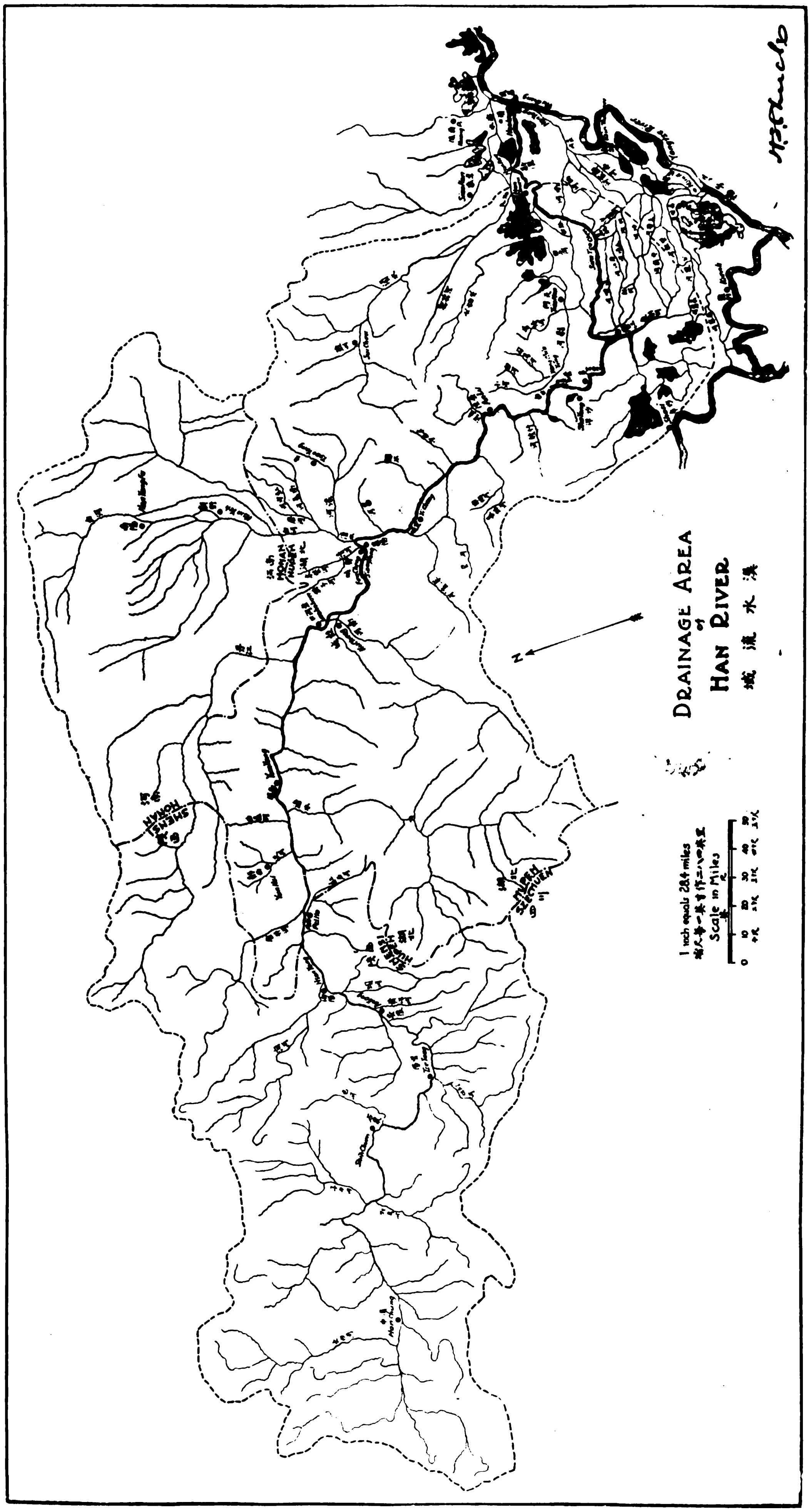
A break of the levee at Tsien Chia-wan during summer flood of 1921

From its source to the town of Siang Yang, a distance of about six hundred miles, the general direction of the river is easterly. Then it flows in a general south-easterly direction for a distance of about one hundred and fifty miles, to the village Tsuk Kow, in the neighborhood of Chin Chiang Hsien. From this point to its mouth, at Hankow (meaning the mouth of Han), the general direction of the river is again easterly. The total length of this river is approximately nine hundred miles, draining an area of approximately sixty thousand square miles.

The principal tributaries of the Han river are: the Fu Ho joining the Han at Hsin Kow, the Pei Ho and Tang Ho just below the town Fen Cheng, the Nan Ho joining the Han at Ku Cheng, the Tan Chiang about fifteen miles above Laohokow, the Tu Ho about ten miles above the town Yun Yang, the Hsun Ho joining the Han at Hsun Yang, and the Ta Pei Ho just above Han Chung. The special significance of three of the tributary systems is worth mentioning. The Tan Chiang, the Pei Ho and the Tang Ho drain a large territory in the province of Honan, and these rivers serve as some of the principal trade routes for the inland commerce between the provinces of Honan and Hupeh. The water of the Fu Ho not only flows into the Han river but also, through a series of lakes and creeks, into the Yangtze river by the Seven Mile Creek in the neighborhood of Shen Chia Chee.

Records show that the difference of water stages reaches twenty-five feet at Fen Cheng, twenty-seven feet at Sha Yang and thirty-one feet at Sien Tao Chen.

This study chiefly concerns the lower part of the Han river. Therefore, the descriptions which follow are limited only to this section of the river, especially between the cities of Siang Yang and Hankow.



Drainage Area of the Han River

The Lower Han

The Lower Han is a silt-bearing river, flowing through a basin of alluvial and sand deposits. The belt of country which is subject to the overflow of this river varies in width from a couple of miles to about fifty miles. The deposits of this country are generally sand and clay or a mixture of these materials and occasionally gravel. The gravel deposits are generally found between the towns of Yi Cheng and Siang Yang.

The course of the Lower Han is characteristic of its kind, consisting of a series of bends of varying magnitude and curvatures, and straight stretches between the bends. The channels at the bends are generally more definite and much narrower than those of the straight stretches. At the bends, the deep water is always near the concave side of the bank. The channels are generally wider at the straight stretches. On this account, the velocity of the current in the straight stretches is generally slack, resulting in sedimentation, forming chutes, islands and bars. These are constantly washed away by the high water and formed again, thereby causing what is known as the "shifting bottom" of the river.

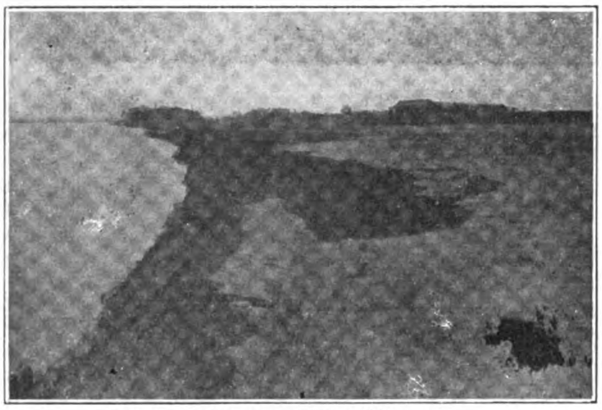
Between Siang Yang and Anlu, the river practically runs wild. Although there is a rather definite low water course, limited only by sand banks, the high water generally floods the lowlands for miles on either or both sides of the river. These lowlands are generally sandy and a few stretches are of gravel deposits. At some localities the land is clay. Wherever the land is of clay, it is generally high, sometimes above the ordinary high water level. The right bank between the towns Yi Cheng and Siang Yang is of this nature. The river bottom of this section of the river is most unstable. It shifts constantly even at the slightest fluctuation of water levels. This renders navigation on this part of the river very difficult and uncertain.

There are few ranges of low hills, some of which are located along the river bank and others, a few miles away. Wherever a range of hills is located on one side of and near to the river bank, the opposite side is always low flats, invariably of sand, stretching out for miles and subject to the overflow of the river even at average high water stage.

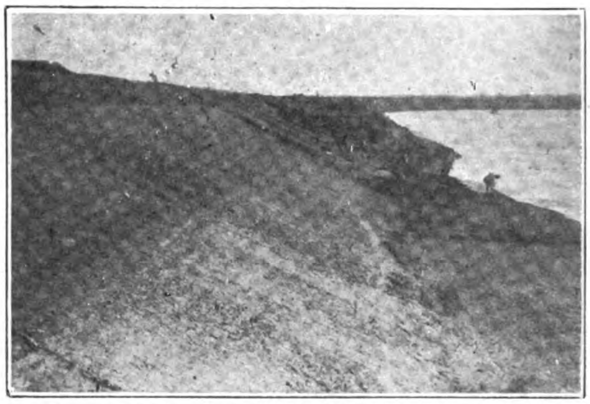
Chiefly on account of that the banks are mostly of clay, the channels of the sections of the river between

Anlu and Hankow, with the exception of a short stretch near Sha Yang which is sandy, are more defined. The low water channel is fairly defined and regular and the high water is confined within limits with levees. During extreme high water stage, the lowlands behind the levees are sometimes twenty or thiry feet below the high water level. This is what accounts for the grave danger at the time of high water stage and the disasterous results in case of a break in the levee. The country made up by the districts, Shao Kan, Yin Cheng, Kin Shan, Tien Men and Han Chuen, is a large area of flat lowlands full of shallow lakes with a few sprinklings of low hills. The natural drainage of this area of lowlands is from Anlu south-eastwards towards Hsin Kow. Between Anlu and Hsin Kow, the Han river has practically no tributary to drain these lowlands. In fact, they are hemmed in by an almost continuous levee to prevent the overflow of the Han. The only outlet of this large drainage area is the Fu Ho, located at Hsin Kow. A glance at the map will show the readers immediately, the disaster which may be brought to this large tract of land in the case of a break in any portion of the levee between Anlu and Wong Chia Ying. Han Chuen district, being the lowest and located at the immediate outlet of the flood water always suffers the heaviest. The successive breaks of the levee at Wong Chia Ying during the summers of 1919 and 1921 had brought untold sufferings to these districts, and Han Cheun, the greatest.

Method of earth tamping in levee construction at Tsien Chia-wan. A stone about 70-lbs. in weight is lifted and let fall on the loose earth



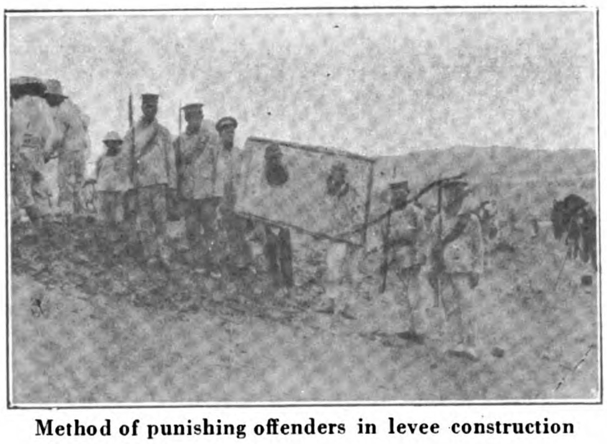
Bank caving near Tsien Chia-wan



Low water bank properly sloped for revetment; near Tsien Chia-wan

The mouth of the Han river where it empties into the Yangtze is too small to take care of the water of the river during high water stages. In time of freshet, the current of the water at this locality sometimes develops to such a high velocity that it is extremely dangerous for navigation of small crafts. On account of the commercial domination of the land near the mouth of this river, it may be financially impossible to widen this part of the river. On this account, a relief canal may be helpful. A proper survey will show immediately the feasibility of such a scheme.

At present, the Han river has another outlet into the Yangtze river through the Tung Kin Ho by the way of Chin Chiang district. This outlet connects the Han river at the village Tsuk Kow and the Yangtze at Ching Tan Kow about 180 *li* below Hsin Tee. Another possible location for a relief canal is through the series of lakes and canals west of the city of Hankow, connecting the Han river at Hsin Kow and the Yangtze by the Seven Mile Creek in the neighborhood of Sher Chia Chee.



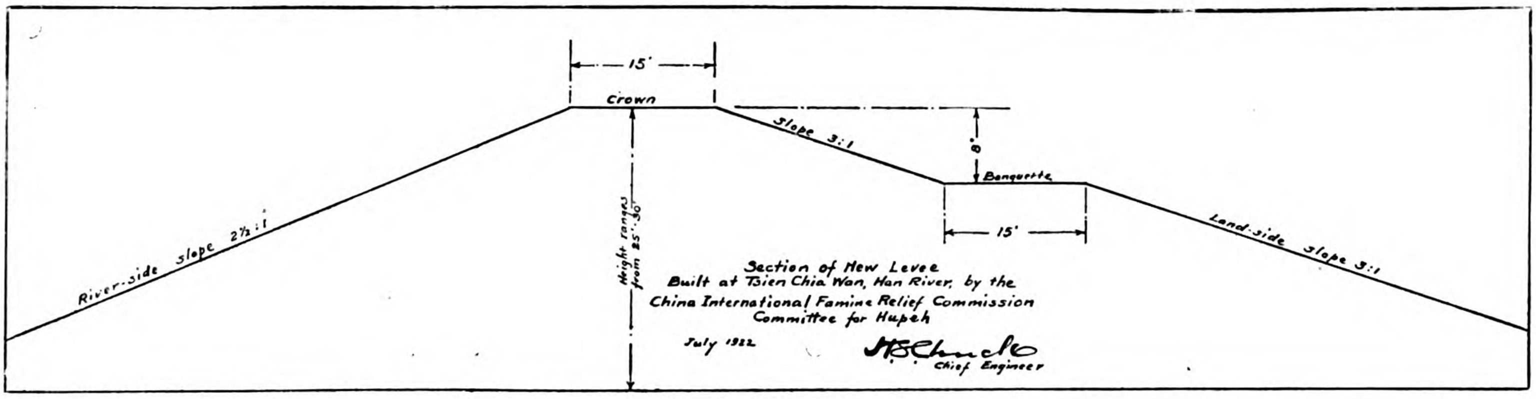
Method of punishing offenders in levee construction

Levees

Levee is a common name given to the system of earth embankments built along the sides of any river of alluvial character for the purpose of preventing inundation of the lowlands situated on the sides of the river. Some of the most notable levee systems of the world are those of the Po river in the northern part of Italy and the Lower Mississippi of the United States. Such a system of levees, although not so scientifically well built and maintained, is found along both sides of the Lower Han river. As having been noted, the Lower Han flows through an alluvial plain, varying in width from a few miles to about fifty miles. The system of levees is, therefore, to serve the same purpose as those of the Po and Mississippi; namely, to protect the lowlands from inundation.

According to ownership, the levees of the Lower Han may be classified into two classes : the people's levee and the government levee. The cause of these classes of ownership has never been clear in my mind but may be explained as follows: Originally, all levees were built by the government. As time progressed, when the financial demand of other sources, not necessarily more worthy, became heavier, the ability of the government to do public service was much curtailed. During such time of emergency, when the government was thus rendered helpless, the responsibility of levee repairs and construction naturally fell upon the people.

In general, it may be stated that there are two main objects in the construction of levees : first, to confine the flood water of the river within a certain channel, and, secondly, to protect the farm land on both sides of the river from inundation. To serve these two purposes, it may be said off-hand that the best system of levee that can be built is to follow closely to the river bank. This view may be accepted as sound and wise if the river should keep to its banks constantly. But this is impossible in nature. Banks are constantly eroded and the river constantly changes its course. On this account, levees are generally located at some distance from the river bank. The rapidity or the rate of erosion of the bank in front of the levee is a large determining factor upon the question



Section of New Levee

of levee location. A rapidly caving bank, especially along the concave bend of the river, shortens the life of the levee back of it, unless the bank is properly and strongly reveted. All other points being favorable, the economic consideration of the location of a levee to be built between two points is to follow the curve of the river thereby increasing the length and cost of the levee but enclosing and protecting more land or to build it in a straight line there—reducing the length and cost of the levee and leaving some land unprotected. All these questions require thorough study into the local conditions and behavior of the river as well as experience. It is generally accepted by best authorities on levee location that any levee having a life of twenty or thirty years is wisely and economically located.

Chiefly due to the lack of unanimity in action or the lack of central control, the types and cross section of the levee built in the different districts along the Han river vary. The crown width varies from ten to thirty feet and the side slope from 1 to 1 (1 foot horizontal to 1 foot vertical) to 3 to 1 (3 feet horizontal to 1 foot vertical). The slope generally used is 2½ to 1 (2½ feet horizontal to 1 foot vertical).

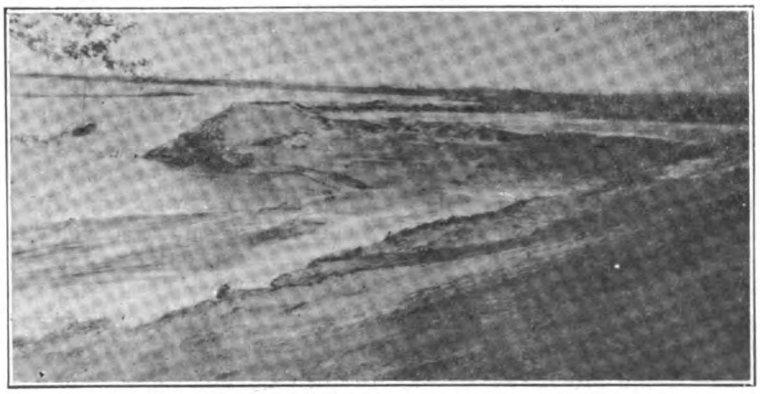
Animal about size of an ordinary dog, very common at Tsien Chia-wan, which bores into and lives inside the levee

On account of the shortness of time when I was connected with the works of this river, it is rather too soon for me to say just what is the best and most economical section to be used for this river. The adoption of an economical section requires some time for the study of the local conditions, behavior of the existing levees and the soil. No doubt, the most economical section is one that involves the smallest amount of earth-work (cheapest) and will resist the hydraulic forces of the river with the greatest efficiency. I have, however, an opportunity to try out one section at Tsien Chia Wan. This new section differs from all the existing sections at present used along the Han river, the new feature being the introduction of a banquette of fifteen feet wide of the land-side of the levee. This section has a crown width of fifteen feet, a river-side slope of 2½ to 1 (2½ feet horizontal to 1 foot vertical) and a land-side slope of 3 to 1 (3 feet horizontal to 1 foot vertical). The banquette is 8 feet below the crown.

I have noticed that chiefly due to an improper knowledge of the behavior of the hydraulic forces of the river, some very abrupt points, like the bank-heads, were built out from the levees which were located near to or at the low water bank, extending into the river from ten or twenty feet to about a hundred feet. These bankheads were constructed with earth and strongly protected with rock facings and sometimes with pile foundations. The local name for these bankheads is "chee tow." The bank immediately above and below the "chee tow" is sometimes protected with stone masonry but most times not. The popular opinion of the "chee tow" is that it will deflect the current of the river to the opposite bank, thereby protecting the bank on the same side and below the "chee tow." This idea of the protecting power of the "chee tow" is certainly erroneous. The effect of the "chee tow" is exactly the same that of a "false point." The tendency is the development of an eddy current on the down-stream side of the "chee tow" thereby causing the bank below it to be eroded. The effect of the "chee tow" is therefore exactly the opposite to the local popular conception. A very good proof of this erroneous conception of the protecting power of the "chee tow" is seen at Sze Tze Kow (see illustration below) where the levee, forming the river bank below the "chee tow," being unprotected, has about half of its section eroded away during the flood of 1921, almost causing a catastrophe.

The levees of the Han river are built with clay or a combination of sand and clay. At some localities, where the deposits are all sandy, earth is transported from a distance, sometimes as far as a couple of miles. Levees along sand banks, where earth is scarce, are generally built with a sand core with earth facing on both sides. This method is adopted chiefly due to the difficulty and high cost of getting earth from a distance. When such practice is resorted to, the levee should be built with the greatest care so that the sand is properly weighed down with good earth both sides.

It is absolutely essential to use good earth in the construction of all important levees, even if the earth has to be transported from a distance. The first cost of the levee may be high, but it is a good insurance of safety against possible catastrophe. When good earth can be obtained from both sides of the river, it is better to obtain all the necessary earth from the river-side of the levee, starting the excavation at least a hundred feet from the toe of the levee and sloping the excavated land towards the river. If earth on the river-side is insufficient, it may be obtained from the land-side. Before starting work on the levee, the ground should be first prepared by



Effect of "false point" (chee tow) at Sze Tze-kow near Anlu: looking up stream

clearing off all old logs and stumps. Sometimes, the ground is covered with a scum and full of cracks due to the shrinkage of the mud brought up by the river. When such condition exists, the scum or the top layer of earth must be first removed and the ground excavated down to the bottom of the cracks. The foundation must be tamped hard before the first layer of earth is placed. The earth is placed in layers usually about a foot thick and each layer is tamped hard before the next layer is placed. Some engineers recommend that a ditch, the " muck ditch " about five feet deep and about five feet wide, should be dug along the centre line of the levee and built up again with good earth. The purpose of the ditch is to ascertain whether there is any logs or tree stumps or other rottable matters in the foundation. Although this is not quite necessary, it is a good practice. If the site should show any suspicion as to the presence of logs or rottable matters, this precaution should certainly be taken. If a " muck ditch " is dug, it should be again filled with good earth in layers and tamped hard as in levee construction.

The river-side of the levee should always be protected by sodding or facing with rocks. This is to prevent any possible erosion during the high water stage and sloughing due to heavy rain during the low water stage. Rock facing is very expensive. Sodding with good grass is almost an effective a protection, unless the levee is located near the river bank and along the concave side of the river. In such case, rock facing should be used. There is a popular opinion that trees planted on a levee offer a sort of protection with their roots holding the soil together. Only to a certain extent this is true. But the slight beneficial effect is entirely obliterated by the possible danger which they may cause. During high water season, the levee is more or less saturated and the earth of the levee is softened. Any high wind during the high water season may easily blow down the trees with their roots thereby endangering the safety of the levee.

Although there are inspectors paid by the government, under the control of the Hupeh conservancy bureau, and stationed at different sections of the levee along the Han river, the duties of both the conservancy bureau and the inspectors have been so neglected that there is practically no central control. On account of this negligence in duty, these inspectors have practically no definite responsibility. Besides drawing their monthly wages, they do not seem to have anything to do. Moreover, the presence of some of these inspectors is sometimes a source of danger. Some of these inspectors are treacherous characters. Living constantly in an idle state, they are ever looking forward for a break in some part of the levee. A break of the levee is a god-sent chance to them. I was told that some of the most treacherous characters even would go so far as to cause a break by some underhand scheme. This necessitates work ; and work, of course, means extra money, irrespective as to whether it is rightfully or wrongfully gained. I do not by any means desire to condemn all the officers and inspectors who are connected with the levee works. Many of them are absolutely conscientious and honorable characters. I have come in contact with several men, in connection with my works on the Han, who gave their whole time gratis or at a very low salary to superintend levee repair and construction with absolutely no other motive than philanthropic.

It is a pity that it seems to be the characteristics of the Chinese people in general to neglect the maintenance of any structure after it is constructed. The maintenance or rather the lack of maintenance of the levees of the Han river is a good example. After the levee is constructed, no thought is given to its maintenance until the structure deteriorates into such a condition so as to endanger the safety of the whole structure itself before any attention is given to it. Sometime they even have the patience to wait until the total failure of the structure before anything is done to it. They are then forced by circumstances to replace the entire structure with a new one after much damage is done by its failure.

Besides the total lack of maintenance, there are many abuses which I have noticed along the different sections of the levees. These abuses are: cultivation along the slope of the levee, excavating earth from the slope of the levee to add to its height, rooting grass for fuel on the slope of the levee by the poor farmers, burrowing holes into the levee by hogs and other animals. The last is not abuse by human hand. But since it is not being looked after by the inspectors, it may be termed so indirectly. All these abuses tend to loosen the soil of the levee thereby increasing the chances of sloughing, saturation and even failure.

As a suggested scheme for the maintenance of the levee system, I offer this plan. All the levees should be placed under the government control, and the work divided into sections. Each section is to be placed under the responsible charge of an officer to be known as the district officer or engineer. All these district officers are held responsible to a central office located at Hankow or Wuchang, under the charge of a chief officer or engineer. It goes without saying that this chief officer must be an experienced and conscientious engineer. A gang of proper size is stationed at each section to take of all repairs during the low water season. During the high water season, a very strict watch should be kept on the behavior of the levee and the gangs should be held ever ready to cope with any possible emergency. It should be the duty of each district officer to patrol his district at least once a day. The duty of these section gangs. besides keeping the levee in repair, is to watch the levee from all possible abuses. A proper scheme for the finance of levee repair and maintenance is not difficult. I understand that there is a steady revenue which amounts to no small figures from various *likin* stations annually specially devoted to this purpose. But this fund has always been misappropriated. Besides, I was also informed that there is an annual conservancy tax paid in to the government regularly by the different districts in the Han river valley, and this fund is supposedly devoted to levee repairs and construction. This fund, I understand, also amounts to no small figures. The difficulty seems to lie not on the finance itself but rather in its proper appropriation.

Levees may fail through three sources: (1) Overtopped by flood water; (2) sloughing; (3) flow through a crevice developed the levee.

Failure due to the first cause is very uncommon. Levees are generally constructed with sufficient height to take care of ordinary high water. But cases have happened every hundred years or so when certain sections of levees have been overtopped by abnormal flood. When a levee is overtopped by flood water, it takes but very little time for the inrush of water to develop a gap which soon enlarges sometimes to a length of two or three miles. With a proper maintenance gang, catastrophe due to this cause may be avoided by the careful watch and quick action of the gang. When the water comes to within a dangerous height of the levee, a fortress of sandbags should be placed immediately on top the embankment. These sandbags raise the height of the levee and sometimes are quite effective in averting a disaster. This necessitates the keeping on hand of a good stock of sandbags at all important sections of the levee.

Sloughing is due primarily to seepage through the body of the levee. All levees are built with earth and are therefore not absolutely impervious. They all seep more or less, and the amount of seepage depends upon the cross section of the levee, the quality of materials with which the levee is built, and the solidity of construction.

During high water stage, the earth of the levee is more or less saturated and the line of saturation dips downwards from the high water level on the river-side towards the toe of the levee on the land-side. If the cross section is too small, combined with poor materials or improper construction or both, seepage may develop. Such seepage tends to develop sloughs on the land-side of the levee. When any seepage is developed and the seepage water is not properly drained off immediately, the water flowing through the sloughs will bring along with it, earth from the levee, thereby endangering its safety. When a levee begins to seep, the seepage water should be drained off immediately to prevent sloughing. A very effective method which had been very successfully used on the Mississippi, is to cover the whole seepage area with a layer of brushwood, care-

fully weighed down with rocks. Care should be taken in not using too much rocks to overweigh the brushwood. The chief idea of the brushwood is not to try to force the seepage water to flow through it but rather to let the water to flow under it, and the brushwood acts as a sort of impediment to retain or hold back the earth which tends to flow with the water.

Sometimes the seepage water develops into a little stream, bringing along with it, sand and clay from the interior of the levee. When such condition occurs, it should be looked after more carefully. This method has been successfully used in some localities of the Mississippi river, is to build a pond around the seep hole on the land-side of the levee with sandbags, not allowing the water to flow down the slope. The water collected in this pond develops a back hydraulic pressure and may stop the flow. But the ingress must be located. Sandbags, and earth if the current is not too strong, must be thrown into the water at the locality of the ingress to try to stop the water from flowing. Large seepage holes may develop into a crevice.

Crevice may be developed in the levee by the enlargement of seepage holes, logs or other matters rotted in the levee. The only possible method in trying to stop the flow of water through a crevice after it is developed is by the method just described in the last paragraph. But this even seldom attain any success. Many engineers recommend that after the water had gained a certain headway, in the crevice, no attempt should be made to close it, as such attempt invariably proves to be futile.

In connection with levee failures, due to crevice, it is interesting to cite an incident which happened on the levee failure at Tsien Chia Wan, a village about thirty *li* below Sha Yang, during the flood of 1921. A farmer just behind the levee, desiring to have some water for his crop, dug a little channel on top the levee. He expected to draw just sufficient water from the river through this channel and then dam it back again. But unfortunately, the water rose on him suddenly and soon got beyond his control. The channel begun to widen rapidly, and, within a few hours, the whole levee gave away, developing a break of about a thousand feet long.

Macao's Big Harbor Improvement Scheme

Dutch Firm Secures the Contract

A BEGINNING is about to be made with the long-discussed harbor project at Macao. According to the " Hongkong Daily Press " a considerable portion of the work is to be put in hand within the next few months, the tender of the Netherlands Harbor Works Co. having just been accepted, at roughly six-and-a-half million dollars, subject to certain conditions and reservations with respect to unforeseen circumstances that may arise, e.g., typhoon damage during the progress of the work.

Three great firms were in the running for this important contract: Sir Whitworth Armstrong, Ltd., Newcastle; the Pacific Construction Co., Vancouver, B.C.; and the Netherlands Harbor Works Co., Amsterdam, whose agents are the Holland-China Trading Co. Tenders were to be sent in by April 18 of this year, but at the request of one of the tenderers an extension of a month was granted and finally another extension to June 20. On that day two tenders were handed in at Macao to the Jury. The Pacific Construction Co., notified that they could not submit full specifications in the time.

The Dutch Tender

The tender of the Netherlands Harbor Works Company has been found the more advantageous of the two, and terms were finally arranged between the Macao government and Mr. Van Exter, the Company's representative. Certain reservations are made in respect of circumstances beyond the control of the contractors. These problems will be dealt with as and when they arise and it may be that, if unforeseen difficulties are unexpectedly numerous, the scheme will be modified in some respects in order to keep within the sum of seven million dollars or so that the Macao government has in hand for this work.

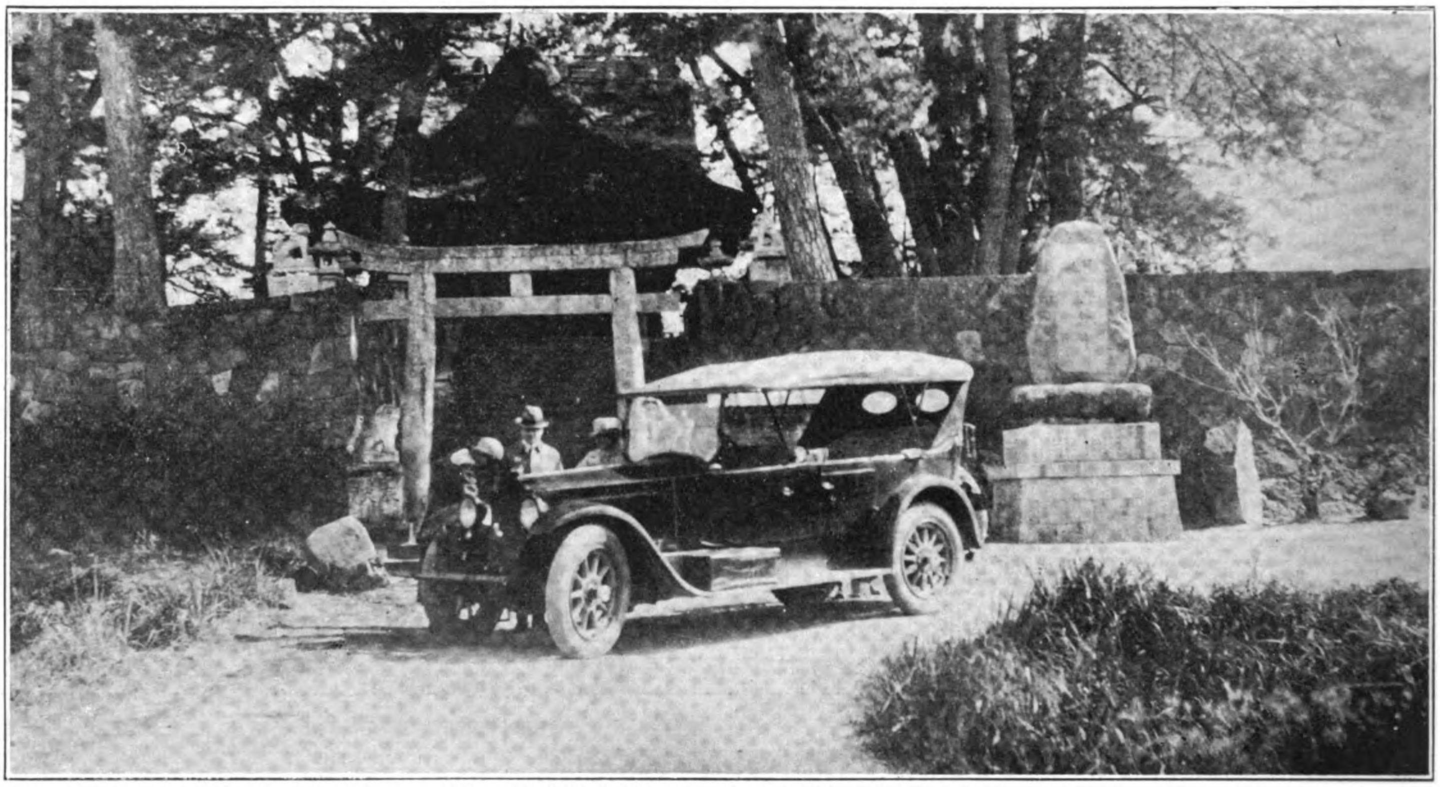
The Netherlands Harbor Works Co. completed in 1921 the Chefoo Harbor Works improvement scheme at a cost of four-and-a-half million dollars. Besides bringing to Macao from Chefoo the extensive plant used there, the Company will bring from Europe a number of powerful dredgers and towboats, in order to expedite the work as much as possible. Operations will begin in about four months' time and it is estimated that the work will occupy three years.

The most recent proposals for the Macao harbor improvements were estimated to cost between $15,000,000 and $20,000,000. It was proposed to make extensive reclamations in front of the Praya Grande and in the junk harbor near the Green Island Cement Works: also to cut a canal connecting the inner harbor with the Canton river and a channel to deep water and to construct an " artificial port " by building two sea walls and a breakwater.

The scheme now to be carried out comprises a reclamation extending approximately from the corner of the Praya Grande, known as the San Francisco Battery, to point known as Macao Siak. On this reclamation, ultimately, offices and godowns will be built. Projecting from the reclamation, the contractors are required to build two sea walls and a breakwater enclosing a water area partly dredged to 21 feet l.w.s. (low-water at spring tides). It will also be possible to build out piers from the inner side of the walls and so give further facilities for handling cargo from this "artificial port," as it is called, the contract provides that a channel is to be dredged to the deep water channel—a distance of approximately three miles. The channel will be about 100 feet wide at the bottom, and 21 feet deep. The Macao government's estimate of the cost of the reclamation, the " artificial port " and the three mile channel was about four-and-a-half million dollars, but the lowest tender—that of the Netherlands Co.—was higher than that sum by two million dollars.

The plans of the work, on which the tenderers prepared their estimates, were prepared by Admiral Hugo de Lacerda, the director of the port of Macao, who has been working on the project for several years. Admiral de Lacerda planned and superintended the important harbor works at Laurenco Marques.

The Imperial Steel Works at Yawata, Japan, has completed construction of its plant for making tin plate. This plant was erected with a view to checking imports of tin plate from America. Its estimated annual capacity is 20,000 tons, although, Commercial Attaché James F. Abbott reports from Tokyo, the first year's production is not expected to exceed 6,000 tons.



A Packard Twin-Six at a Wayside Temple in Japan

The Passenger Car Market in Japan

Interview with Mr. William I. Irvine, U.S. Trade Commissioner

MR. WILLIAM I. IRVINE, the automotive expert of the U.S. department of commerce, has completed an exhaustive survey of the Japanese and Chinese markets for automobiles and trucks. Portions of his comprehensive report have been released and published in many American newspapers attracting unusual attention for the mass of new and accurate detailed information which has enabled American manufacturers to gather an intelligent idea of the needs and possibilities of this promising market. Of special interest and trade value are his findings on the present and future possibilities of the passenger car market in Japan where it was expected that with the recovery of European industry after the war that an attempt would be made by the automotive manufacturers to re-enter the markets in which their cars had met with favor in the past. "Many predictions were made," says Mr. Irvine, "that the hold which America had secured on the Japanese market would be seriously weakened as the Japanese had a decided preference for European cars and only bought American vehicles of necessity. These predictions have fallen far short of realization as yet. The losses which American cars have sustained have only to a small degree been the result of vigorous competition the gains by European manufacturers have been due to the fortuitous circumstance of a tax levy which operates against American cars. And as to whether these gains will continue there is doubt even in the minds of the sellers of European vehicles. In numbers of cars imported into Japan, America has always led and but once has taken second place in value and so in view of the wide familiarity it is safe to make the prediction that American cars will always hold first place, providing manufacturers cultivate the market. In this opinion the majority of Japanese dealers concur.

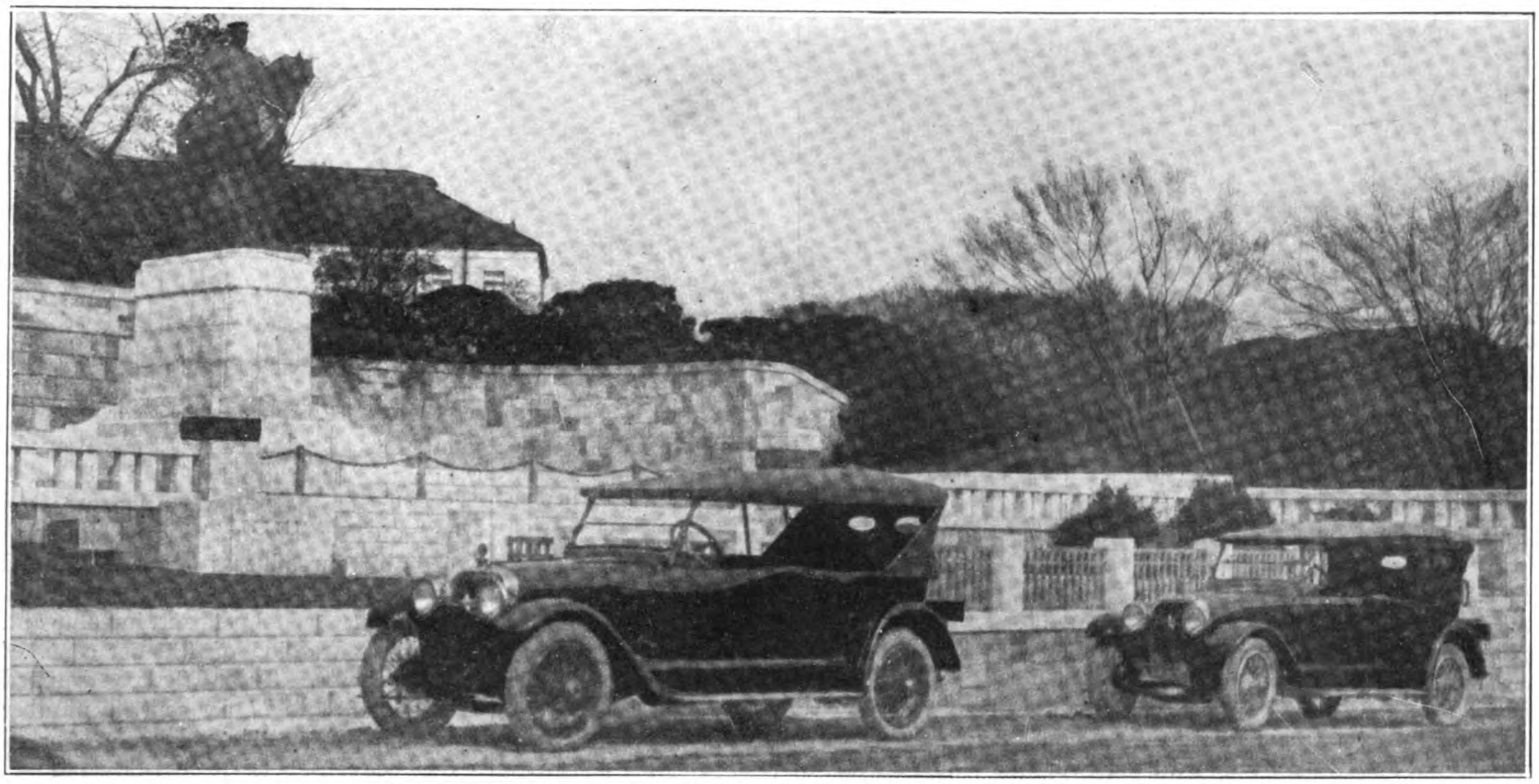
"The relative importance of the contenders for the Japanese market are shown by the following table of imports of motor cars published in the 'Annual Return of the Foreign Trade of the Empire of Japan.' Values given are in Yen (1 yen=.4985).

Countries			United States	Great Britan	France	Italy	Germany	Others
Year	Number and Value							
1912*	Value	...	505,377	218,697	42,566	57,166	62,436	6,704
1913*	Value	...	487,325	257,098	64,670	108,409	187,381	—
1914	Number	...	37	20	2	15	17	3
,,	Value	...	60,297	64,059	8,765	56,977	40,223	10,289
1915	Number	...	22	5	1	2	--	—
,,	Value	...	30,481	19,910	3,096	9,100	—	—
1916	Number	...	196	12	1	6	3	—
,,	Value	...	320,941	28,052	800	33,904	3,100	--
1917	Number	...	851	3	1	—	—	5
,,	Value	...	1,548,804	12,077	500	—	—	7,449
1918	Number	...	1,636	1	1	13	—	1
,,	Value	...	4,426,938	2,500	2,000	91,935	—	1,400
1919	Number	...	1,520	2	—	—	17	38
,,	Value	...	5,275,000	23,000	—	—	123,000	108,000
1920	Number	...	1,684	27	14	4	1	15
,,	Value	...	4,608,000	142,000	53,000	26,000	3,000	32,000
1921	Number	...	832	75	83	46	22	15
,,	Value	...	2,160,638	476,480	353,432	160,645	32,000	88,160

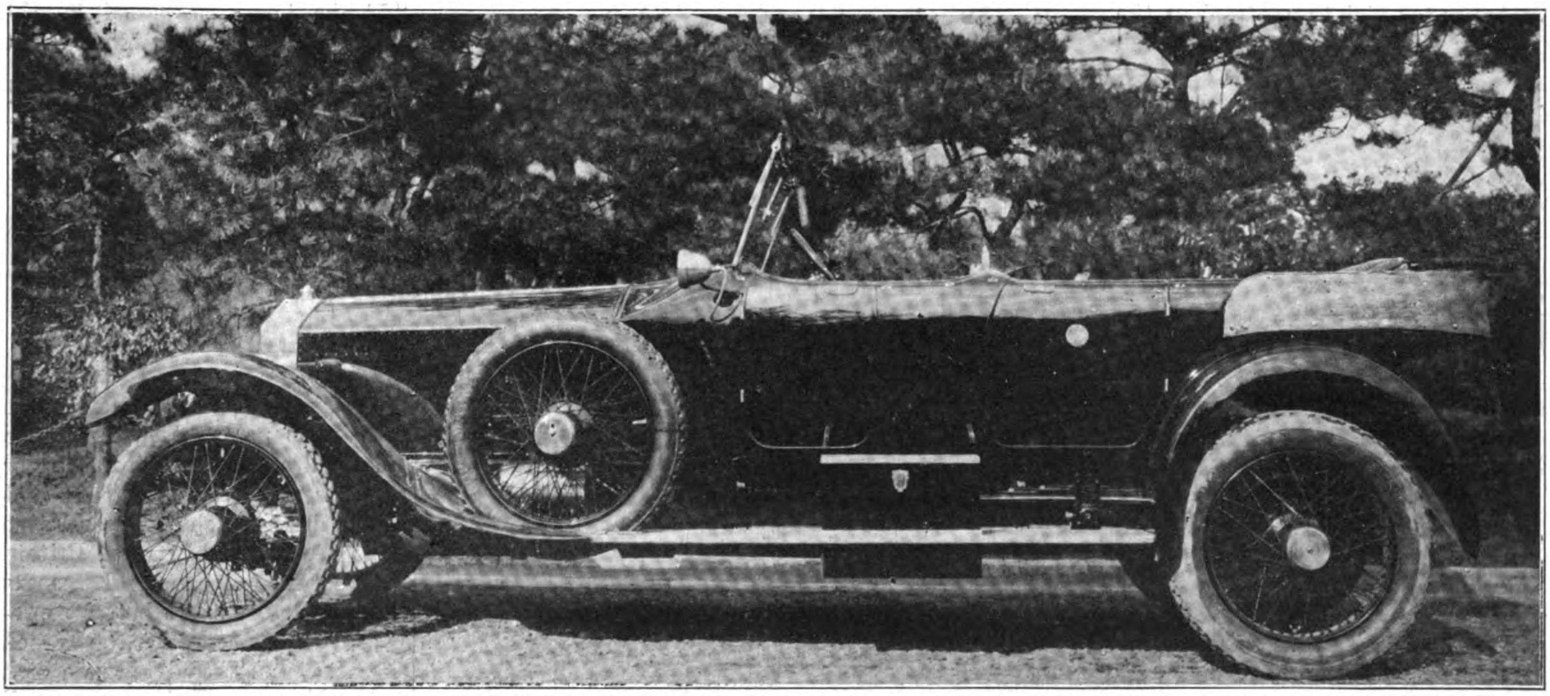
*Parts included.

"Cars and trucks are jointly classified in the Japanese customs returns so that to get a true picture of the number of cars imported from America the following allowances for truck imports must be made: 1916, 10 per cent.; 1917, 10 per cent.; 1918, 22 per cent.; 1919, 40 per cent.; 1920, 44 per cent. These percentages are derived from published figures of the numbers of cars and trucks exported from the United States to Japan. No allowance need be made for trucks from any of the other figures as practically all trucks in Japan are of American origin.

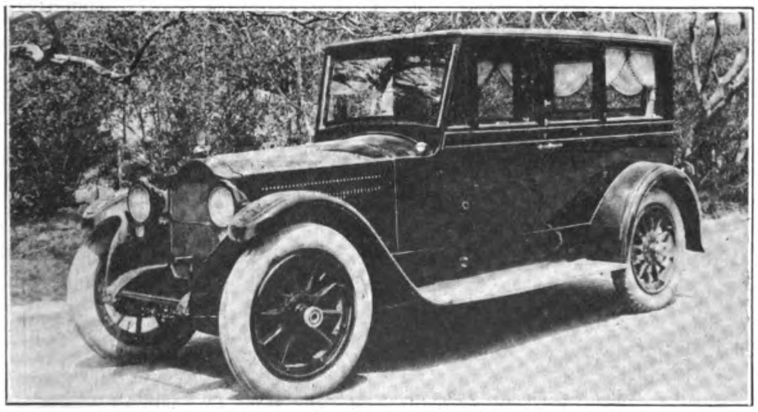
"But the true picture of the market cannot be gained without taking into consideration the imports of spare parts, for under this



Mercer Touring Cars used by the Japanese Army outside the War Office, Tokyo



The Magnificent Rolls-Royce Car Ordered from Sale and Frazar by the Imperial Household Department for the use of H. R. H. The Prince of Wales

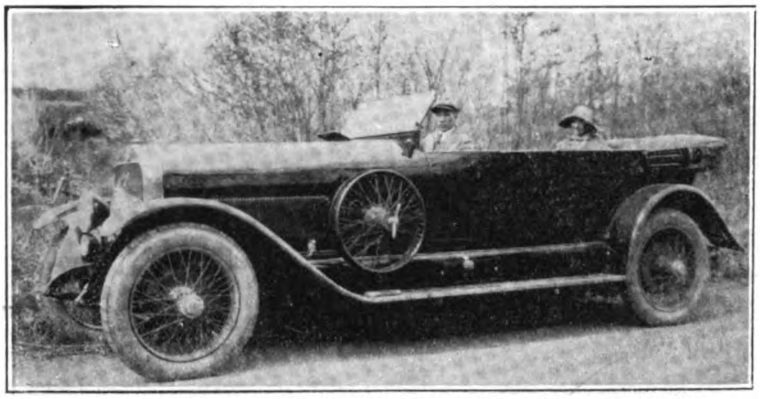


Packard Car bought by the Osaka Municipality for the use of H.R.H. The Prince of Wales

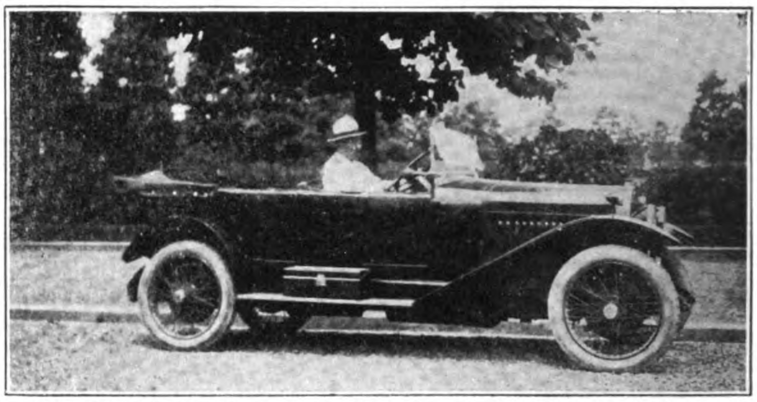
heading are entered hundreds of disassembled cars and trucks. The following figures of the imports of motor parts from 1914 to 1921 are from the same source. Values are in yen :

Countries / Year		United States	Great Britain	France	Italy	Germany	Others
1914 Value	...	140,496	31,962	30,945	31,822	23,745	533
1915 Value	...	37,263	13,710	11,945	24,738	5,287	26,234
1916 Value	...	380,705	18,820	9,362	17,388	—	416
1917 Value	...	1,084,009	—	11,000	—	—	—
1918 Value	...	3,134,000	—	1,000	—	—	—
1919 Value	...	5,568,000	—	22,000	155,000	—	4,000
1920 Value	...	5,453,000	83,000	35,000	12,000	7,000	18,000
1921 Value	...	4,037,376	438,150	139,481	87,827	44,681	34,061

" A definite idea of the number of cars represented by the imports of parts may be gained by using the figures of Y.2,550 as the unit value per car. From this deduct 550 as the approximate

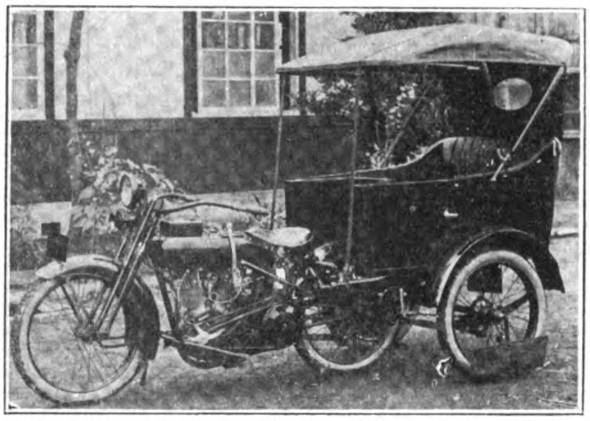


Largest Car in Japan: Isotta-Fraschini, 100 H.P.; 8 cylinders in line



Delaya Touring Car, 4 wheel brakes, owned by Baron Shidehara

value of spare parts per car. The unit value is reached on the following calculation. The number of cars and trucks exported from the United States to Japan during 1920 was 4,029. The foregoing import tables show that the total value of cars and spare parts imported into Japan for the same period was Y.10,961,000. The division of the American number into Japanese value gives the approximate unit cost in yen, after the parts figures are reduced 6 per cent. to allow for tires which are included as spare parts. The figure of Y.550 is probably too high to use to show the value of spare parts imported for each

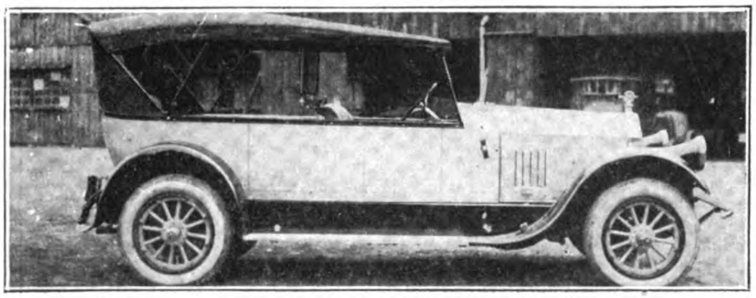


Harley Davidson with Rear Car Attached: Rear Car built at Nakano

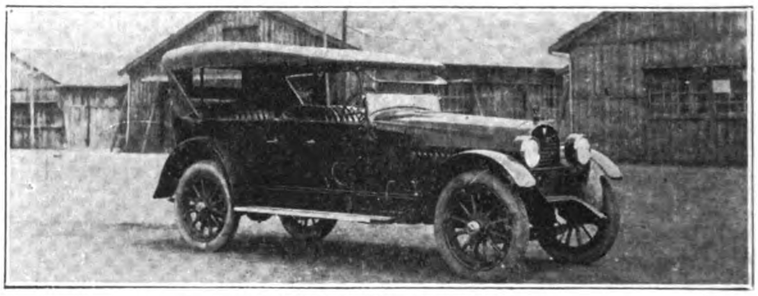
market. Beginning in 1920 European manufacturers re-entered the field but it was not until 1921 when the new tax went into affect in Tokyo that a preceptable inroad was made. In 1920 American car imports were 95 per cent. in number and 93 per cent. in value and within a fraction of 100 per cent. of spare parts. These figures dropped during 1921 to 77 per cent. in number and 66 per cent. in value of cars and 84.5 per cent. of spare parts.

"Sources of Competition

"If the losses sustained in the value of cars and parts combined Great



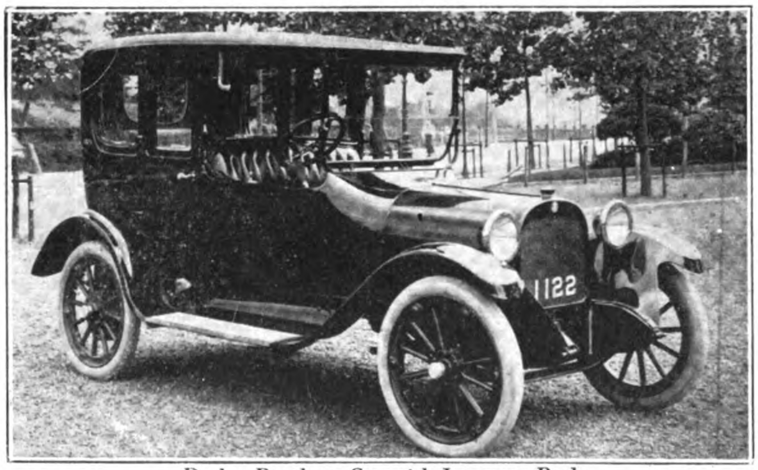
New Pierce-Arrow (1922): Japan Automobile Company



Hudson Touring Car

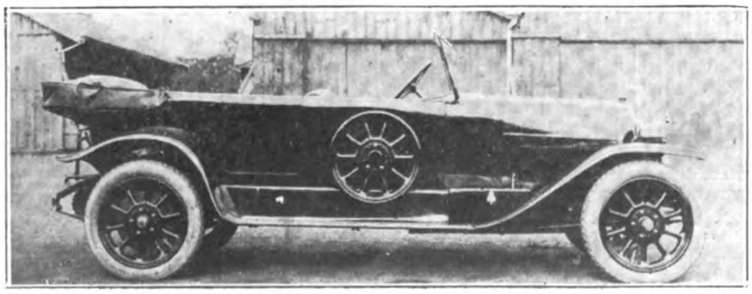
car, but it is suggested in order to give a more conservative figure.

"A comparison of the values of complete vehicles with spare parts shows that since 1919, the value of the latter has exceeded the former. Thus more than one-half of American automative vehicles are imported as spare parts which further proves that Japan is a greater chassis than a complete car market. The foregoing tables show that with but one exception America has lead in Japanese imports and that for the period from 1916 to 1921 it dominated absolutely the

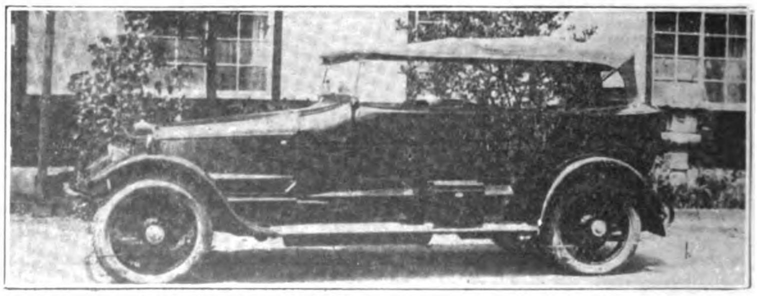


Dodge Brothers Car with Japanese Body

Britain has gained a fraction less than 50 per cent. with France second and Italy third. In car numbers France leads Great Britain by eight. The relative position won by Great Britain will probably be held for its manufacturers are better represented than are either the French or Italian. The advantage which the Tokyo tax gives the small cylindrical dimensions cars has enabled British manufacturers with their light cars to establish themselves much more rapidly than they could have done had the past taxing policy been con-



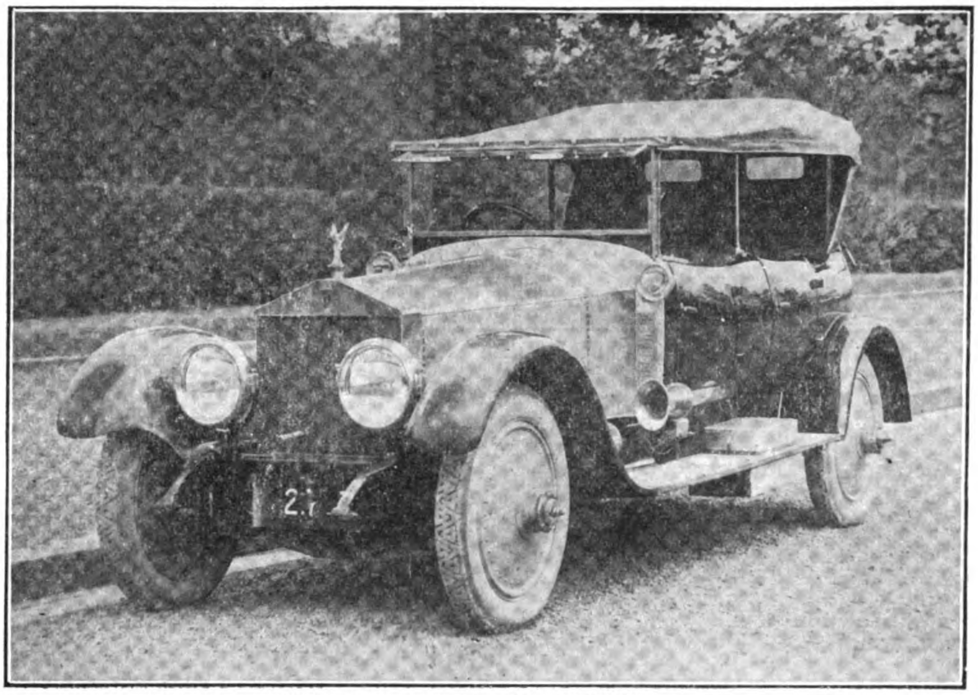
Fiat Car: Sold by Japan Automobile Co.



Daimler Car: Sold by the Japan Automobile Co.

tinued. This is demonstrated in cities outside of Tokyo where the small light car has yet to make any definite impression upon the market. The general run of European light cars average 10 to 15 horse-power under the Tokyo system of rating while American cars as a whole are rated at over 20. One American car which sells in the United States for less than $1,000 falls into the same tax class as the British Rolls-Royce, a perfect illustration of the inequality of the tax.

" Although as a group British manufacturers lead in competition against American, no single manufacturer has made a decided impression on the market. A few cars of each make have been imported but in the whole field the individual is lost sight of. It remains for an Italian car—Fiat—to head the list of European competitors of American cars. The small Model 501 has made a very favorable impression and has the good fortune to be in the hands of one of the soundest Japanese dealers with an organization not limited to Tokyo. This car falls into the 5 to 10 horse-power class and is reported to give 23 miles to the gallon of gasoline. Equipped with a 4-seated touring body it is quoted at Y.7,000 ($3,500), but it is alleged that there is no fixed price and that sales have been made well above and below this figure. Second in importance in number sold is the French Model Renault, 10 horse-power, followed by the Citron, also French, rated under 10 horse-power. The former with open 4 seat body is quoted at Y.7,500 ($3,750) while the latter is said to sell for Y.6,000 ($3,000). Other light cars which are being sold are the British Bean, 9.83 horse-power, closed body, Y.7,000 ($3,500): Wolseley, 10 horse-power, 4 seat, open body, Y.6,000 to Y.7,000 ($3,000 to $3,500): Mathis which is a French cycle car, selling for about $2,500. The following are represented and a few of each have been sold: DeDion (French), Humber (British), Bianca (Italian), Austin (British), Standard (British), and Rover (British).

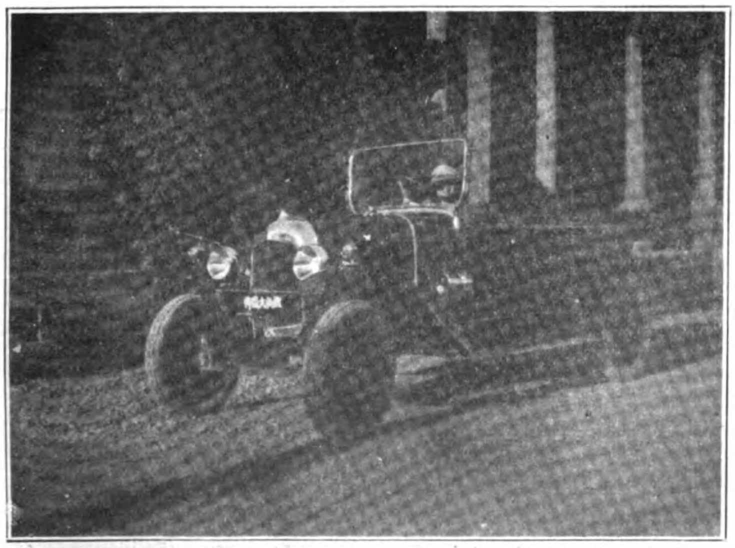


Rolls-Royce owned by Mr. E. H. Hunter

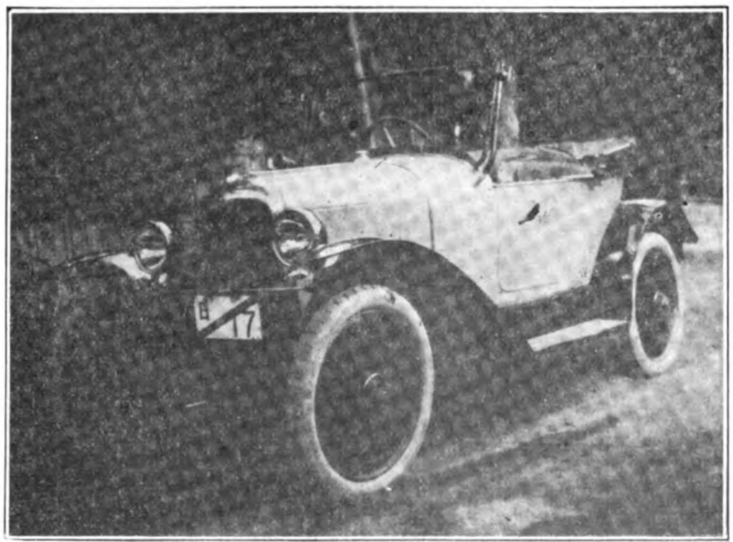
"The Advantages and Disadvantages of the Light Car

"The principal points in favor of light cars are small horse-power rating which gives it the advantage of a lower tax, economical gasoline consumption, long tire mileage and low mechanical maintenance costs. These are the arguments used in advertisements. Against this as counter claims are the comparatively high prices and the fact that these cars are not built to meet the severe operating conditions of Japan, which has been discovered by some of the first buyers of this type of car. The cars are designed primarily for use in the countries of their origin where there are excellent motor roads. The roads in Japan and especially in the streets of Tokyo are very different from European highways and it is doubtful if the cars will stand up for long. The opinion was expressed by an American service man who has had an opportunity to examine some cars after considerable use that in most of the small cars the rear springing, rear axe construction, and method of taking the power from the transmission shaft are inadequate for Japanese operating conditions. This opinion is borne out with several cars which have practically been dropped by their distributers because of the constant complaint of owners.

" Operating against the continued popularity of this type is the fact that open cars are not popular in Japan for the following reasons : owners will not ride in the same body with the chauffeur ; the frequency of rains and the clouds of dust on dry days. (In passing it may be noted that the soil is very porous in Japan and only by constant sprinkling can the dust clouds be reduced. It is a common sight to see streets being sprinkled twenty four-hours

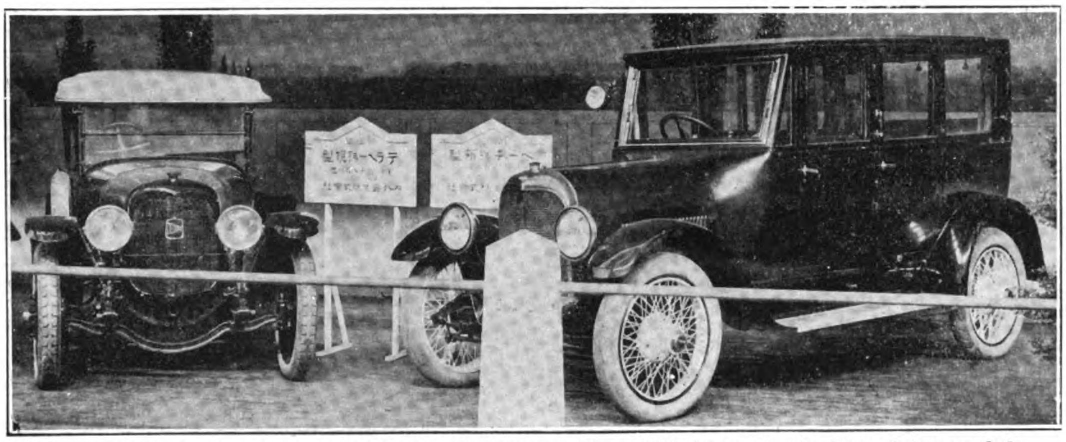


Citroen Torpedo, special de luxe, sold to Mr. P. Claudel, the French Ambassador



5 hp. Citroen—Two Seater

after rain). These conditions compel the use of an enclosed body. The European light cars are primarily designed as two-seat roadsters but this has not prevented their Japanese distributers from fitting them with heavy limousine bodies. It is questionable if these light cars can perform satisfactory for any length of time under constant overload. Unless these cars can be equipped with limousine bodies they cannot hold in the market. Motor cars are primarily designed for social purposes and protection must be given to gala costume and the uncovered heads of women for Japanese ladies never wear hats. The light construction of the car and the heavy bodies do not make for comfort. Dealers admit that complaints have been made that the cars jolt so badly that the elaborate coiffure of the ladies and high hats of the men have been ruined by coming in sharp contact with car roofs. It is not patriotism so felt that causes Americans in Tokyo to call first on the company that operates American cars in its taxi service when in need of cars.



Paige and Dela Haye Cars Exhibited at the Tokyo Pleace Exhibition by the Naigai Automobile Co., Ltd.

" Speed claims are made for all these light cars running anywhere from 35 to 50 miles an hour, but the opportunity to test them is rarely afforded because road conditions do not encourage touring. The advantages which American cars enjoy of acceleration and hill-climbing ability is not fully appreciated due to the absence of the owner-driver class. Chauffeurs do not appear to mind gear changing frequently but there is beginning to be complaints about the poor hill-climbing ability of the light cars and owners are noticing this. The average Japanese has considerable vanity and dealers have said that owners are not pleased when a car passes them on hills without difficulty.

" The *pros* and *cons* of the situation are being studied and not a few dealers are willing to predict that the popularity of light cars may be short lived, especially when economic conditions improve. The present business situation is such that the matter of taxes and operating costs receive disproportional consideration which will not continue with the return of prosperity, for the average owner in Japan is comparatively wealthy.

"Competition of High Price Cars

" The tax question has but slight bearing on cars that sell in Japan for $5,000 or over. The principal aid to the sale of European cars in this class is the belief entertained by many that European cars are superior to American. The majority of the European quality cars fall in the 15-20 horse-power group, but it is doubtful if buyers give much heed to this fact for practically every high-class car carries two men. The majority of these cars are represented by small dealers or by firms that are associated in other lines with British interests. European car agents are very enthusiastic about the cars they are receiving as compared with the rather apathetic attitude of the distributers of cars of similar class of American origin. The only reason which the latter offers for the frequency of European car sales is the prejudice which the Japanese have for things European and the fact that the imperial household department which buys about one-fourth of all quality cars has set an example which Japanese, very loyal to the throne, are following. It is doubtful if many of the recent buyers have purchased because they really decided between the mechanical qualifications and superiority of European and American cars. On the other hand the growing popularity of European quality cars may be due to the lack of attention which American manufacturers of high price cars give to the overseas market. Several high-grade cars are very poorly represented in Japan while the dealers of others seem to lack conviction regarding the merits of the cars in their charge. It appears as though American manufacturers may do some profitable educational work among their distributers.

" The European cars of this class are Rolls-Royce, Crossley, Armstrong-Sidley, Daimer, Sunbeam, Vauxhaul, all British: Renault, Delage, French: Fiat, Lancia, Isotata, Italian: Opel, Protus, German and the Austrian Diamler. Of these the best sellers are the British Daimler and the Renault followed by Fiat. With the exception of the Renault 12-18 model which sells for Y.12,000 ($6,000), the Model 505 Fiat, 15 horse-power which sells for Y.10,500 ($5,250) and the German cars which fluctuate almost from week to week from Y.9,000 ($4,500) to Y.12,000 ($6,000), the quality cars sell from Y.15,000 ($7,500) to Y.20,000($10,000.) The British Daimler is probably the most popular of the European cars.

"Dealers Attitude to European Cars

" In nearly every instance when dealers were asked why they had taken up European cars, especially the light models which sell at a higher average price than the average American, they replied that it was a matter of self-defense, necessary if they were to keep their organizations together. They maintained that they had to have something to sell and that the tax had practically cut the American business to less than one-half. Some declared that they did not want to handle European cars prefering to have all-American lines as it was confusing to do business with several nations because of the different methods employed and stated that if the taxes were considerably lessened they would discontinue their European light car connections for American cars were cheaper and when they could buy them at the reduced prices it would be difficult to sell European cars.

" It must be borne in mind that of the stock of about 750 cars unsold in Japan to which reference was made in the report on current business conditions in Japan as of April 4, 1922, that fully 80 per cent. were bought at the prevailing high prices of 1920. Not until these are disposed off will the disparity between European and American prices be fully shown.

" Summed up it would appear that American manufacturers as a whole have a fine opportunity to continue to dominate in the Japanese market as the success of European manufacturers rests on a rather insecure basis.

"Types of Cars Preferred

" Japanese owners and prospective buyers are not mechanically minded so the Japanese field is free of discussions of technical qualities which often influence sales. Dealers rarely discuss the mechanical features except to express hope that American cars of the future may be designed to allow for greater economy of operation. Occasionally a man will talk of shorter wheel base and narrower tread only to contradict himself by talking of roomy bodies as requisite to Japanese requirements. There has been no crystialization of opinion of four and six cylinder cars or types of higher

multiple. Every design, even up to the straight-eight, is on the market so that it may be said that any standard car can be sold in Japan, provided it is backed by an energetic selling organization.

" It has been shown by the import statistics the market demand is primarily for chassis. Complete cars entered are special limousine jobs and touring cars. Japanese body builders have been compelled to specialize on the limousine because of the decided preference for this type. So universal is the demand that builders carry a few in finished bodies on hand, leaving the upholstering and general luxury touches to be settled by the buyer. Nearly all Japanese limousines provide for at least five people and sometimes six. A frequent sight in the country is a very popular low price American car equipped with a limousines body with three extra folding seats. Coupé and sedan styles are a drug on the market as several dealers have learned to their costs. One has ten coupés on hand and has been unable to sell any during the past year. Manufacturers first entering the market or dealing with a new agency should hesitate about sending any body types other than limousine or touring. There is a very small demand for roadsters to meet the requirements of foreigners or the small amount of Japanese who are beginning to drive their own cars. The influence of women in car sales may almost entirely be discounted, hence features which appeal to women in America such as easy driving or special comfort count for practically nothing. Due to the narrow streets, short wheel base cars will always have a decided advantage.

" Standard equipment on cars should include magnetos otherwise dealers must supply them at a cost in excess of what the American manufacturer could. In this connection it must be borne in mind that when a Japanese buys a car he holds the opinion that every part is made by the car maker and so if anything goes wrong with a piece of equipment he blames the car, therefore, it is good policy to equip with standard magnetos rather than allow the dealer to equip with one of poor quality which will reflect on the car. The selling price also includes mud splash guards, spare tire, bulb horn, electric horn and an electric light in the rear roof of the car. The law requires the rear seats to be under lights, so that even touring bodies must be so equipped. Nickel plated parts do not wear well owing to climatic conditions for which reason there is a preference for brass.

"Selling Terms

" Selling on the instalment basis appears to be somewhat disgraceful as all dealers state that they do not do so, while their competitors charge them with the practice, especially at this time when it is very difficult to sell. It is said by nearly all that competition is such that there are six cars on hand for every buyer and so in order to make a sale unusual terms are offered. Under normal conditions it is probable that time payments are not granted, except on the basis of 50 per cent. on taking over the car and the balance within three months. Under Japanese law it is very difficult to recover and re-possession by law is seldom sought. The first thing a dealer does when he gets a live prospect is to make a careful investigation of his bank balance and to make inquiry of his family connections. If these prove satisfactory he may take a three months risk. But the general idea of deferred payments has not taken hold as the class of car owners generally have enough money to pay outright for a car. There are no working-men owners. Car ownership implies a chauffeur and a private garage which in turn means house ownership in a section where streets are wide enough to permit the passage of a car. As a rule Japanese houses are built very close together and the majority are approached through narrow streets, or, what we would term alleys in America. Few houses have basements so that the space required for a garage is almost equal to one-half the size of a house lot, and land is very expensive. In the country districts the farmers are, as a class, too poor to own cars, the sale being limited to the merchant class. The bicycle is still the pleasure vehicle of the masses of people and they are seen in countless numbers in almost every part of Japan. The best selling season is March, April and May, and a short fall season from September 15th to November 1st."

Nobel Industries at the Brazilian Exhibition

ONE of the principal exhibitors at the Brazilian centenary exhibition 1922, will be Nobel Industries, Ltd., who have supported the department of overseas trade in this project from its inception.

Nobel Industries, Ltd., was formed in 1918 and comprises many important British undertakings engaged in the manufacture of explosives and allied products. The interests of the companies have been extended during the post-war reconstruction period and now cover many industries other than explosives.

Their stand will be located in the north side of the western annexe of the British section and the exhibits will be of such a varied and interesting nature that we give them some detail. The whole will be contained in one large showcase.

Generally speaking, the samples of Nobel products are exhibited under four heads: Explosives—Ammunition—Metal Goods—Miscellaneous.

Explosives.—These consist of dummy blasting cartridges illustrating the cartridges generally in use in South America manufactured by Nobel's Explosives Company Ltd. (Glasgow) and Curtis's & Harvey, Ltd., such as gelatine dynamite, gelignite, dynamite—raw materials such as cotton, woodmeal, guhr and nitrate of lead—dummy samples of nitroglycerine, nitric and sulphuric acids, etc. — Detonators and electric detonators, fuse made by Nobel's Explosives Company, Ltd., Bickford Smith & Company, Ltd. and W. Bennett Sons & Company, Ltd., igniters, exploders, cards showing different stages in the manufacture of detonators and detonators connected up with blasting cartridges.

Ammunition.—Under this heading are shown dummy samples of shot-gun, rifle and revolver cartridges made by Eloy Brothers, Ltd. and Kynoch, Ltd., who manufacture in their factories cartridges for any known form of weapon, British or foreign. In addition, sporting powders are exhibited and include such well-known brands as Curtis's and Harvey's "Smokeless Diamond," "E.C.," "Schultze " and Ballistite " and various kinds of black powders.

Metal Goods.—This comprises a big variety of exhibits; wire, sheet and strip in copper, brass and other non-ferrous metals made by Kynoch, Ltd., at Birmingham; semi-manufactured articles such as components for motor accessories ; complete samples such as tubes, cycle parts and brakes, rustless " Roman rims," stoves and petrol lamps and shaving stick cases.

Other interesting exhibits are carbon-free metals, thermit welding including a section of tramrail " Thermit-Welded," and metal powders of various shades.

Miscellaneous.—This embraces a wide range of goods and includes art leather cloth, soft and Collodionised incandescent mantles and vapour lamps, " Necol " Collodion products and the " Lightning " fastener.

The finished article showing art leather cloth such as blotters, cigarette cases, photograph frames, children's shoes, etc., indicate the practical and varied applications of this material as manufactured by the British Pluviusin Company (1920), Ltd., at Manchester. This cloth is very largely used for upholstering motor-cars and railway carriages.

The incandescent mantle exhibits are manufactured by Curtis's & Harvey, Ltd. (Proprietors Lighting Trades, Ltd.) in London and include " Ironclad " brand and soft mantles for use with vapour lamps and lanterns. Attention is drawn to the " Evening Star " lamp which is both effective and handsome.

Amongst the Collodion exhibits made in England by Necol Industrial Collodions Ltd., are "Necol" household cement which is waterproof and unaffected by heat and mends anything, and "Necol" plastic wood, extremely useful to pattern-makers and woodworkers, being a mouldable substance which hardens on exposure to the air.

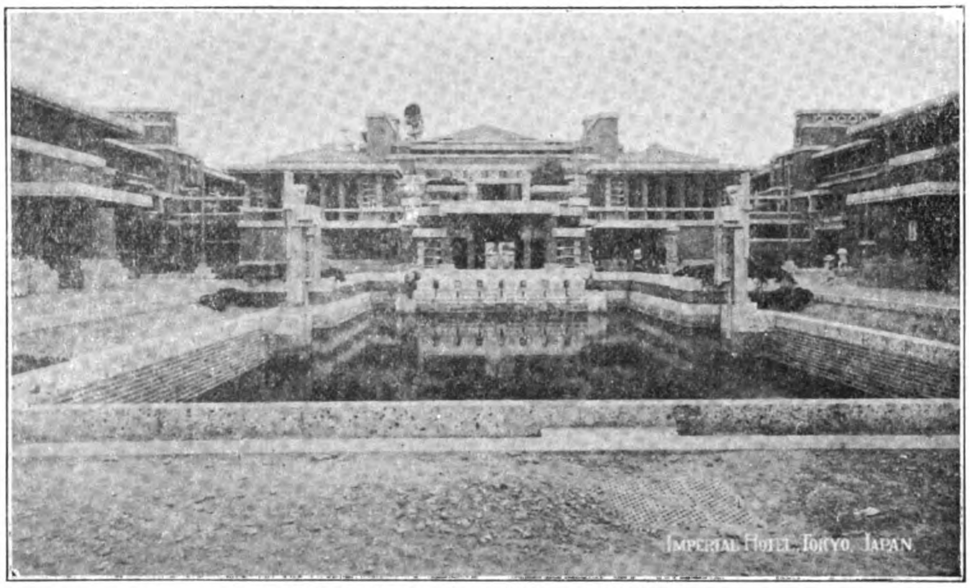
The " Lightning " fastener is a new, quick and efficient fastener made in nickel silver for fancy leather and sports goods and clothing. The samples displayed indicate some of the applications of this clever device.

Tokyo's New Hotel

THE new Imperial Hotel was opened on July 2, 1922, to accommodate the party of Secretary Denby. Although the building is but half completed, the main rooms are now open to the public, and an increasing number of guests attracted by the unusual interest of its architecture and unique fitting, is daily passing through its corridors.

Many criticisms, just and unjust, have been made of the architectural features of the hotel, but little fault can be found with the elegance of its appointments.

There are 250 rooms, many of them *en suite*, all with baths. The principal banquet hall will seat 1,000 people, while there are 10 small banquet rooms where another 1,000 people can be accommodated. The main dining room seats 400 people, and the grill room 250. A concert hall not yet completed will seat 1,100 people, and will be equipped with a stage on which dramatic performances can be given as well as in any theatre in Japan.

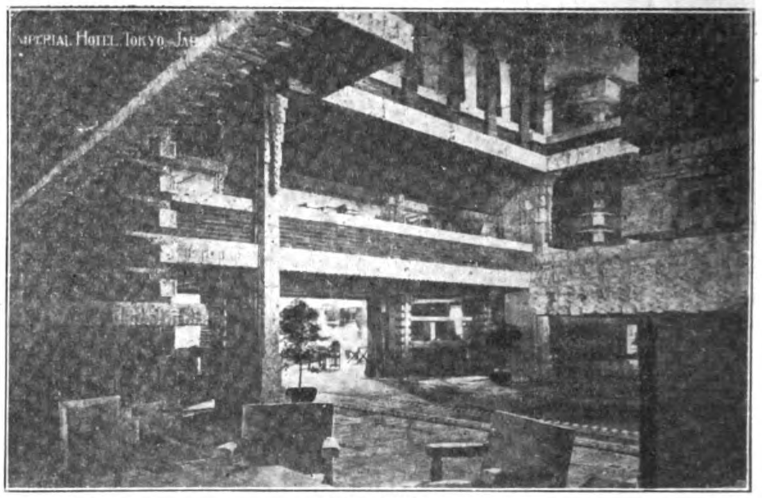


Main Entrance from Hibiya Park Side

A swimming pool 25 by 60 feet is to be equipped with the latest light purifiers, which have been ordered from the United States. The barber shop has the latest sanitary appointments. The laundry equipment is all electrically operated, and all heating and cooking in the hotel is done by electricity. The hotel purchases 1,500 kilowatts of power from the Tokyo city electric bureau to operate this equipment.

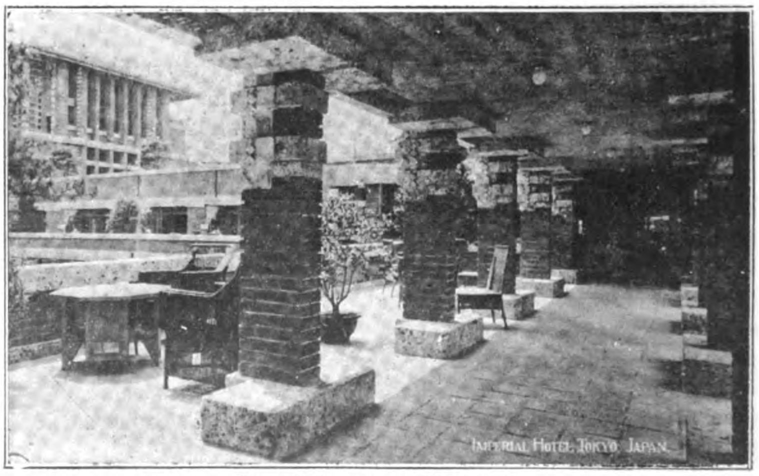
A post office is housed in the street level, and there is to be space for 46 shops each 12 by 18 feet on the same floor.

"Peacock Alley"



Main Lobby

Entrance Hall



One of the many Verandahs

The total floor space of the hotel is 360,000 sq. ft. The furnishings of the hotel were built by the hotel carpenters. The rug were specially made in Tientsin, and are one of the greatest beauties of the hotel. Silver and cutlery were ordered in the United States, and the table china has been made in Japan. The upholstery was imported. There is a telephone in each room of the hotel.

The building is constructed of stone and brown brick. The brick was baked on special orders, and the stone is a peculiar soft leprous looking greeny-grey stone, quarried near Nikko, known in Japan as "Oya ishi."

The hotel is now under the management of Mr. H. S. K. Yamaguchi, of the Fujiya Hotel in Miyanoshita. The Imperial Hotel Company, Ltd., is capitalized at Y.6,000,000, of which Y.3,750,000 is paid up. There are 120,000 shares issued of which 22,000 representing Y.1,100,000 are owned by the imperial household.

The officers of the company are:—

President: The Honorable K. Okura, Jr.

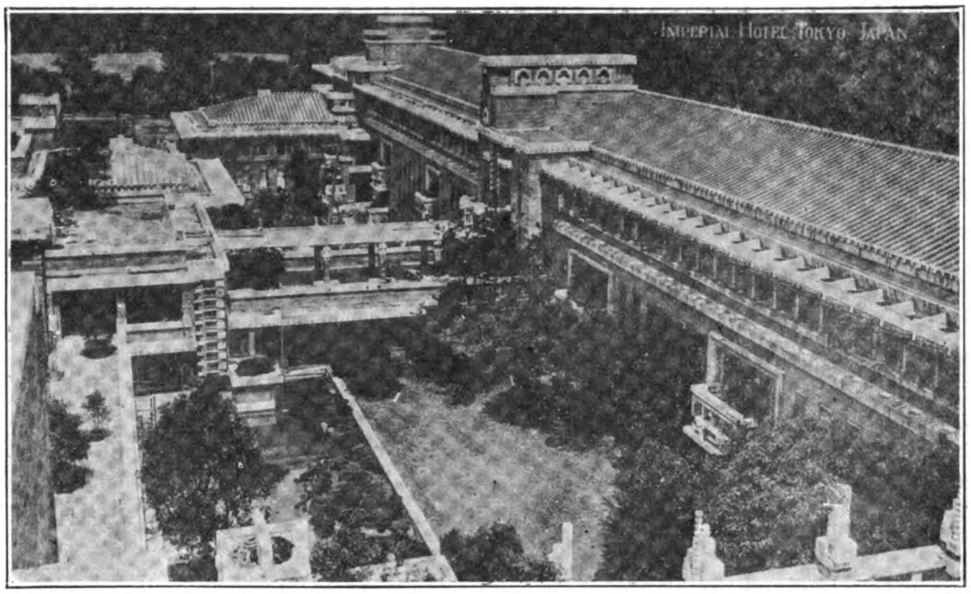
Managing Director: H. S. K. Yamaguchi, Esq.

Managing Director and Auditor: T. Kobayashi, Esq.

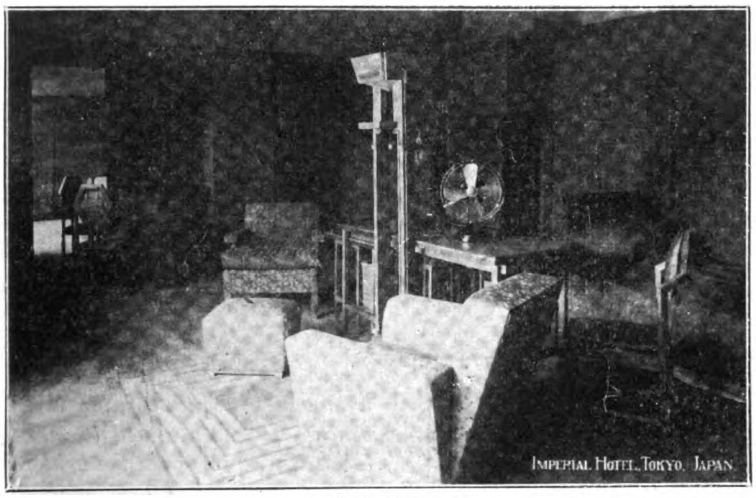
Directors: R. Asano, Esq., I. Wakao, Esq., Jr. and S. Kanaya, Esq.

Auditors: R. Wakao, Esq., and K. Koike, Esq.

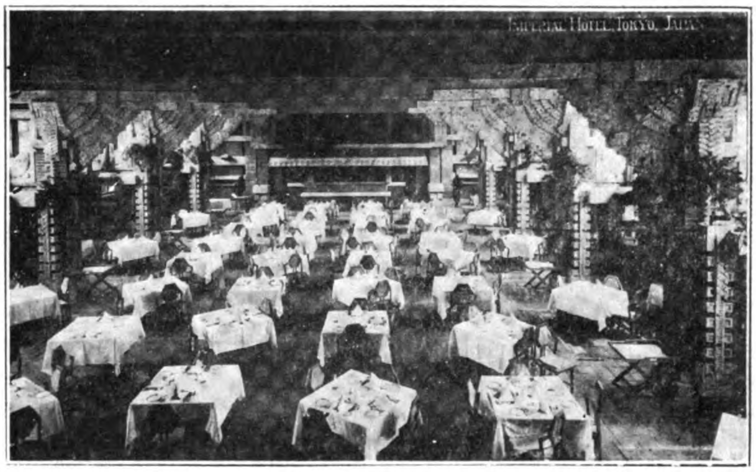
Construction of the uncompleted part of the hotel will be finished in 1923.



View from the Roof



A Guest Room


Main Dining Room

Nitrogen Fixation in Japan

According to a Japanese correspondent at Osaka, Japan, the Suyuki Trading Company, of Kobe, one of the largest commercial concerns in that country, has decided to erect a factory at Hikoshima, near Shimonoseki, with a view to fixation of atmospheric nitrogen by the Claude process. Some three years ago, one of the company's engineering experts was sent to France to investigate the process, and on his return, arrangements were made to proceed with the scheme. Owing to the secrecy with which the plan was worked out, no intimation was given of the firm's intentions until quite recently. It is understood that the scheme is to be carried out on an extensive scale, even by way of trial; and according to a responsible member of the firm, the plant is estimated to produce 10 tons of nitrogen per day during the preliminary tests. When manufacture is commenced on a commercial scale, however, it is anticipated that the output will amount to as much as 1,000 tons per day. The sulphate of ammonia market in Japan is bound to be affected if this venture comes to full fruition.

New Bridge for Tientsin

An international bridge committee is working on estimates for the new international bridge over the Hai-ho, planned at the end of Rue de France and it is possible that public tenders will be requested in the near future.

At the invitation of the committee, a meeting of the representatives of the officials, municipalities and administrations interested in the new bridge project was held in the French municipality recently under the chairmanship of Mr. W. P. Ker, H.B.M.'s consul-general.

The meeting unanimously approved the committee's proposal to build the new bridge in continuation of the Rue de France, and advised that the width of the main road should be 40 feet, the width of the sidewalks 9 feet and that the river fairway between the piers of the bridge should be 140 feet.

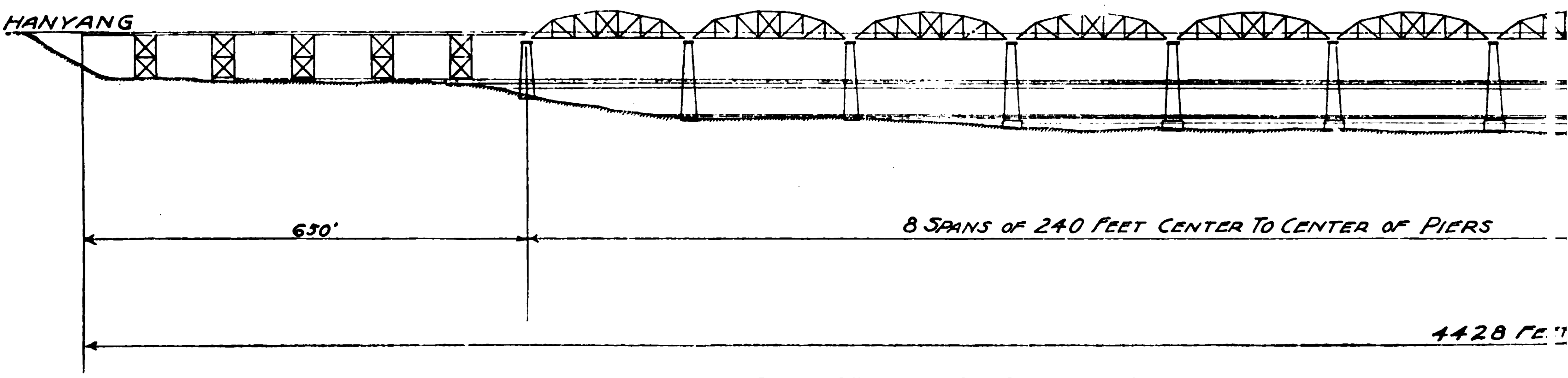
The Proposed Bridges Across the Yangtze and Han Rivers

Report upon a Project to Connect the Northern and the Southern Railroad Systems of China by Bridging the Yangtze and the Han Rivers near their Junction and to Provide Highway and Electric Railway Service between the Cities of Hankow, Han Yang and Wu Chang.

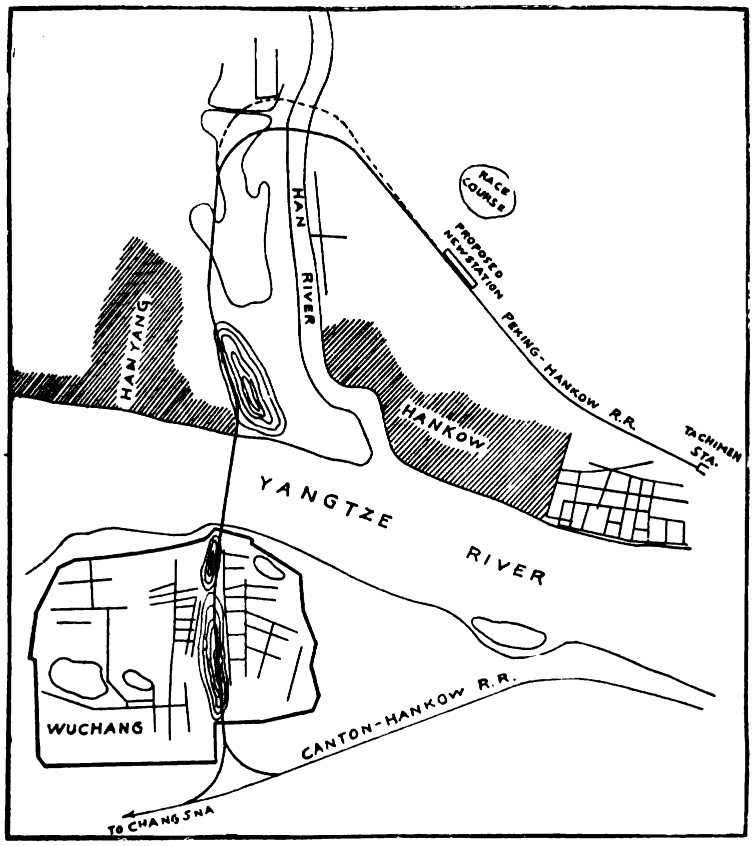
By Dr. J. A. L. Waddell, Consulting Engineer

(Ed. note.—The study of the question of bridging the Yangtze river was made by Dr. Waddell at the request of the Chinese government early in the fall of 1921. The "Commission for the New Bridge over the Yellow River" for which Dr. Waddell had come from America was dissolved at the end of August, and the minister of communications requested Dr. Waddell to remain a few weeks longer for the study of China's major bridge problems, the bridging of the Yangtze river at Hankow and at Nanking. These two crossings were carefully studied by Dr. Waddell and the preliminary plans for bridges were made along with estimates of cost. The investigation occupied several weeks and was accomplished with the assistance of the Peking-Hankow line engineers, at Hankow, and, at Nanking, with the help of engineers detailed from the Tientsin-Pukow line.

The report which follows concerns the bridging of the Yangtze at Hankow and includes the plans for two bridges, one across the Han river from Hankow to Nanyang, and one across the Yangtze from Nanyang to Wuchang. By this means the three cities, Hankow, Nanyang and Wuchang will be connected and, aside from furnishing a direct link between the Peking-Hankow R. R. and the Hankow-Canton R. R. an important municipal problem will be solved. These three cities have a total of more than two million inhabitants and, except for an irregular ferry service and a sampan traffic, are isolated while on many occasions storms close the river communication. The industries in Hankow have developed tremendously during recent years, and real estate has risen beyond all proportion to the surrounding territory. The planned bridges would greatly enhance land values in both Hanyang and Wuchang and would permit an enormous expansion.



Proposed Railway and Highway Bridge between Wuchang and Hanyang Across the



Proposed Crossings of the Yangtze and Han Rivers

There is at present no system of tramways in any of the three cities. It was planned to make the train service over the bridges an interurban one and later to build gauntleted tracks for tramcars.

The project attracted a large amount of interest among those concerned and, but for the recent disturbances in and about Hankow, might now be in the process of promotion. It is at present considered one of the most logical of the larger engineering problems and the benefits to be derived by the people of Hankow, Hanyang and Wuchang make its ultimate construction practically certain. The plans of Dr. Waddell were made in accordance with his carefully developed system of bridge economics and represent a saving of more than ten millions over previous estimates.—(Journal of the Association of Chinese and American Engineers).

Peking, October 26th, 1921.

To His Excellency,

The Minister of Communications,

Peking.

Your Excellency,

In compliance with official instructions, I have made a thorough study of the river, railroad and highway conditions at and near the junction of the Han and the Yangtze rivers, with the view of connecting the northern and the southern railway systems of China and of providing highway and (later on) electric railway accommodations between the cities of Hankow, Han Yang and Wu Chang. The project involves the crossing of both the Yangtze and the Han rivers by " combined " bridges to carry steam-railway, electric-railway, vehicular and pedestrian traffics.

Sites.

Before starting for Hankow I was informed that there was a choice in the location of the Yangtze crossing, viz., either above or below the mouth of the Han ; but I soon saw that the lower crossing should not be considered, as that would eliminate entirely the city of Han Yang, unless there were built an additional crossing of the Han to connect Hankow and Han Yang. Such a combination would not connect Han Yang and Wu Chang, except by passing through Hankow.

As this combination of bridges would cost somewhat more than that of the two bridges above the junction, and as the communications between the three cities should be made as direct and intiemat as possible, I decided upon the upper site for the Yangtze structure. Moreover, this route provides the shortest possible main structure for the crossing of the larger river. The location is almost identical with the one previously selected in 1911 by the civil engineering class of the Peking government university when making a study entitled " Ideas and Proposals for a Highway and Railroad Bridge Across the Yangtze between Han Yang and Wu Chang."

In respect to the location of the proposed Han River bridge, I selected two sites, one for a high-level crossing by the railway and one farther down stream for a low-level crossing.

The three sites above mentioned are shown on Sheet No. 1 of the accompanying drawings.

Source of Information.

In addition to the pamphlet published by the civil engineering class before mentioned, I obtained through the courtesy of Mr. L. C. Kwong of the KinHan Railway a large-scale municipal map of the three cities and a large-scale railroad map of Hankow and some of the adjoining territory across the Han river, included in the exterior portion of the city of Han Yang.

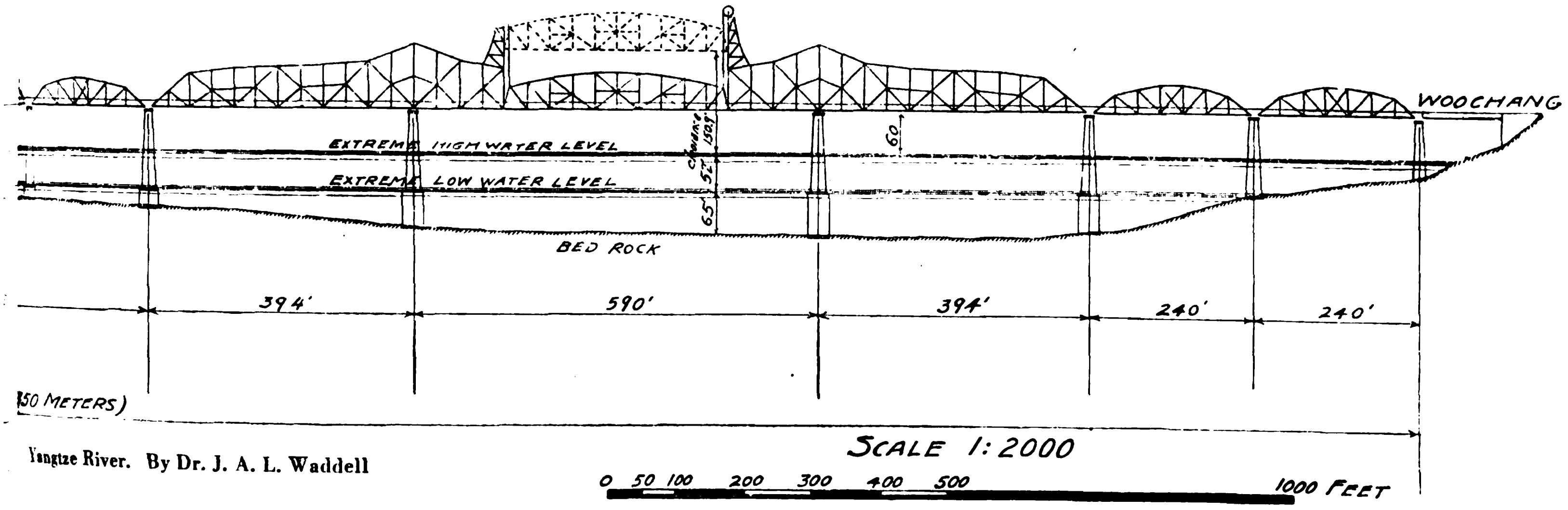
A comparison of the widths of crossing of the Yangtze as given on the municipal map and as shown in the pamphlet just mentioned, indicated a discrepancy of some 220 metres. Consequently I had Mr. Kwong send a small party of engineers to make a triangulation of the river. The result checked the pamphlet within thirty metres, and showed an error of some two hundred and fifty metres on the map. This is probably due to the fact that the said map was printed in two parts that were afterwards pasted together, the junction being at about the middle of the river.

In making a portion of the map on Sheet No. 1 of the accompanying drawings I utilized the erring map by assuming that the two halves had been brought too close together during the pasting ; and in Sheet No. 2 thereof the profile is the same as that given in the pamphlet, excepting only that the width of the river has been increased some thirty metres. The location of the bed-rock given in the pamphlet, I assumed to be correct, because several persons in Hankow informed me that, in making soundings at high stages of water, the sounding-weight indicated by the feel that rock was being struck. Not having available any apparatus nor the necessary time for checking the correctness of this conclusion, I was forced to assume it as being true, and to use it in the preparation of my estimate of total cost of structure for the proposed crossing. Of course, before taking any steps towards the building of the bridge, proper borings to and into bed-rock should be made at a low-stage of water. If any error be then discovered, my figures would have to be corrected accordingly.

In respect to the location of bed-rock for the Han river crossing, I could obtain no information whatsoever, Mr. Kwong was of the opinion that there is none within reach, and that, consequently, pile foundations would have to be adopted ; but I judge that such is not the case. In my calculations of cost I assume that bed-rock will be found at a depth of fifty feet below extreme low water. If this assumption be incorrect, no great error in the total cost will be involved, provided that a satisfactory pile-resistance be found without calling for exceedingly long piles.

Reconnaissance.

In company with Mr. Wang and Mr. Kwong, engineers of the Kin-Han line, I made a reconnaissance, partly by jinrikisha and partly on foot, of a line to connect the Kin-Han road on the north with the Canton-Hankow road on the south. This route is indicated on Sheet No. 1. It is quite satisfactory ; but I should advise draining completely the large lake between the two rivers and dyking against over-flow at high-water stages before building an embankment there. It is true that this would call for a small pumping plant to remove at high-water stages the water that might otherwise accumulate through either rainfall or seepage, or both combined ; but the cost would be warranted by the great value of the land thus reclaimed. At first it could be utilized for



Yangtze River. By Dr. J. A. L. Waddell

agricultural purposes (and as such would be found exceedingly rich and suitable for market gardening); but later it would be needed for the expansion of the cities of Hankow and Han Yang, both of which are now greatly congested. Again, the land between the two rivers will ere long be needed for the establishment of important industries.

It was not necessary for me to walk over the Wu Chang approach of the steam-railway; because, by standing at the summit of the high hill near the river, I could determine the entire route thereof. I saw that by utilizing the steep sides of two long hills. running at about right angles to the direction of the river, an excellent line with easy grade could be located, and that no buildings of any importance need be damaged.

At first I figured upon a high-level crossing of the Han river; but, owing to the location of a proposed union depot, which, for good and sufficient reasons, could not be changed, there would have been necessitated a grade of one and a quarter (1.25) per cent., in order to provide the necessary clearance for passing junks. Later, however, I decided that it would be far better and cheaper to adopt a double-deck structure, having the highway above and the steam-railway below with the grade very close to the extreme-high-water elevation, the railway deck being suspended from the over-head trusses by telescoping hangars, according to the method that I evolved and utilized a dozen years ago when building the Fratt bridge across the Missouri river at Kansas city. This structure is described at length on pages 723 and 728, inclusive, of my treatise on "Bridge Engineering."

The advantages of the low-level railway-crossing of the Han over the high-level crossing are as follows:

First. There is a saving of at least $2,500,000, in the first cost, owing to the entire avoidance of expensive steel trestles.

Second. The cost of operation is much less, due to the saving of some fifty-five feet of climbing.

Third. The total length of the connecting railroad between the north and the south systems is some 7,000 feet shorter by the low-level route, thus saving, by reason of reduced length alone, something in both first cost and operation.

On the other hand, though, there are the following disadvantages:

First. The low-level crossing will interfere a little with the passage of junks, and this interference will increase as the railroad traffic augments, although probably not at all seriously.

Second. The stopping of trains to allow for the lowering of the deck would cause a small loss of time in railroad operation, although by no means as much as that involved by the fifty-five foot extra-climb before mentioned.

On the whole, the advantages of the low-level route greatly outweigh the disadvantages; and if, in the dim and distant future, the river traffic and the railroad traffic should increase so greatly as to cause too much interference, a high-level railroad-bridge could be built so as to divide the railroad traffic between the two structures and thus halve the said interference.

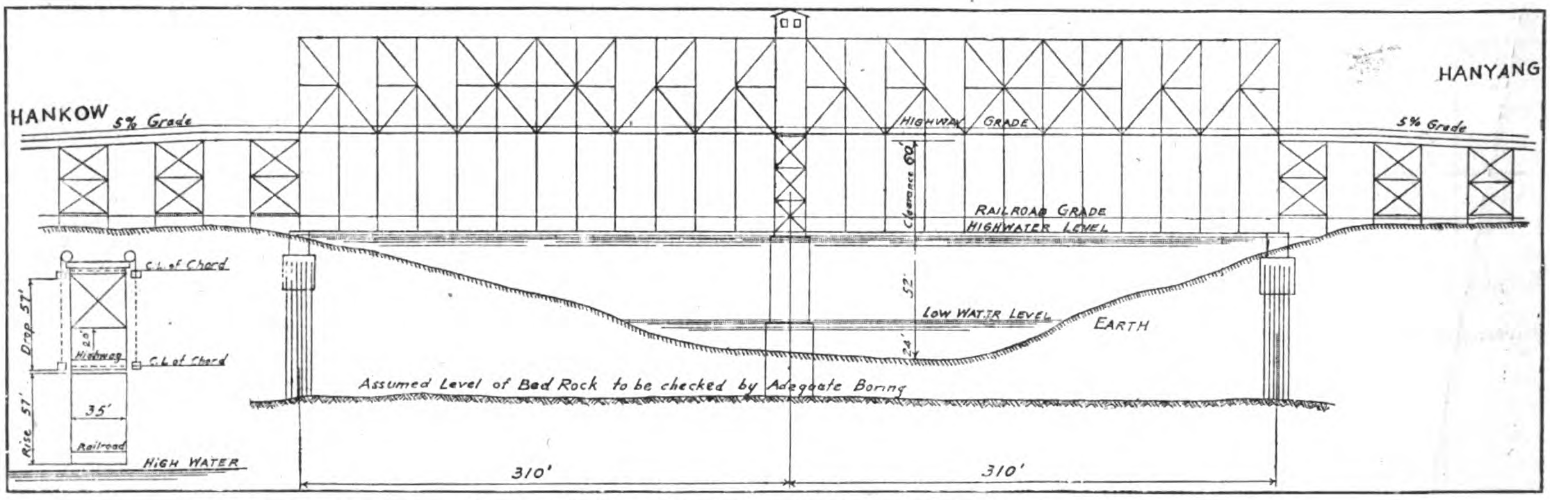
RIVER CONDITIONS.

The amount of junk traffic on both rivers is immense, and numerous craft are constantly moving both up and down stream. On the narrow Han river this is specially noticeable; and it is said that at times one experiences great difficulty there in passing by launch through the mass of vessels that extend from bank to bank. On this account I have deemed it to be both right and economic to allow, between high-water shore-lines in both bridges, a vertical clearance, above extreme high-water elevation, ample for passing the masts of the tallest junks in the district. From personal observation and by enquiry I have set this clearance at sixty (60) feet, but I did not have time to measure the heights of any masts. This assumption is sufficient for the preparation of a preliminary estimate of cost; but, before determining finally upon the layouts of structure preparatory to building, the matter should receive thorough investigation. An increase of a few feet in the clearance would augment the total cost only slightly, because the railroad approaches of the Yangtze bridge run into side-hills at each end at a short distance from the river bank, which distance would not be any greater, were the elevation of grade made a little higher. The larger cost would be mainly due to the taller piers of the bridge and the longer highway approaches. In the case of the Han river bridge, the railroad grade being close to high-water elevation, the railroad approaches would not be at all affected by the higher clearance.

It has been suggested to me that it is feasible in China to compel all junks to take down their masts when passing beneath bridges, as is the case on the Yellow river structures, where the amount of water-traffic passing is small; but on a great internal highway like the Yangtze and upon such a congested stream as the Han, to necessitate the lowering of masts would be an inexcusable hardship to inflict on navigation.

As for the passing of ocean-going vessels with their tall masts at the proposed Yangtze crossing, you will see from Sheet No. 2 that I have provided a vertical-lift span of three hundred and twenty-six (326) feet with a vertical clearance of one hundred and fifty (150) feet, which clearance could be increased, if necessary, at very small expense.

There is a condition of some importance affecting the layout of spans, viz., that large rafts of timber are floated down river. They are both long and wide; and, while it might not be economic to increase greatly the cost of structure so as to accommodate their passage between the piers, it is only proper that the rights of the owners of rafts should be given due consideration. With the layout I have adopted, the smaller rafts could pass anywhere, the least horizontal clearance between piers being a little more



Proposed Railway and Highway Bridge Across the Han River;
By Dr. J. A. L. Weddell

than two hundred feet; but the larger rafts would have to be so steered as to go under one of the three longer spans. The horizontal clearance of the main opening, being over five hundred and fifty feet, ought to give ample facility for the passage of the largest of such rafts, provided it be properly navigated.

Layouts.

As can be seen by reference to sheet No. 2, the layout for the proposed Yangtze crossing, starting from the Wu Chang side, consists of two through simple-truss spans, each 240 feet, an anchor arm of 394 feet, a cantilever span of 590 feet, an anchor arm of 394 feet, and eight through, simple-truss spans of 240 feet each, all measurements being taken from centre to centre of piers. This layout practically covers the entire river between high-water shore-lines.

The layout for the proposed Han river crossing consists of two simple truss spans with parallel chords, carrying a suspended deck for the double-track railway, as shown on Sheet No. 3.

Traffic Provisions.

The question of double-track *versus* single-track for the two structures is one to which I have given considerable thought. In America the question would not have arisen; for experience has taught American railroad engineers that it is always truly economic in the case of a long and expensive proposed railroad bridge to provide for a double-track, because eventually it certainly will be needed. Here, however, where money for big enterprises is scarce, I felt that the point should not be decided without full deliberation.

In view of the fact that the length of the Yangtze bridge and its steel approaches is about a mile, if this length were to be of single track and later both the north and the south trunk lines were to be double-tracked (as undoubtedly they will be some day), the volume of traffic would be far too greatly restricted. It is true that there might be adopted an expedient I evolved and patented in the U. S. A. many years ago, by which the piers are built for double-track, as are also the cross-girders of the superstructure, two of the four lines of stringers being temporarily omitted, the trusses being strong enough for single-track only, and provision being made for building duplicate trusses alongside and so connecting the old and the new ones as to make them divide the total load equally between them.

Were the structure to be a railway bridge pure and simple, such an arrangement might save temporarily a considerable amount in first cost and a large sum of money in interest charge; but as highway traffic has to be taken care of at once, this expedient is really not feasible.

For the Yangtze crossing I have, therefore, adopted a cross-section, as shown on Sheet No. 2, having the double-track steam-railway between the trusses with an eighteen-foot roadway on each side, exterior thereto, and an eight-foot sidewalk outside of each roadway. The traffic on each roadway is to be in one direction only; and this restriction will apply to the sidewalks also.

At present there are no electric tramways in any of the three cities, but the time is coming when there will be; and it will then be highly advisable to connect the tram lines of the three cities. This could be done by building separate approaches to each bridge for the said tram lines, and by running them between the trusses on gauntleted tracks. This expedient obviates the necessity for any switching or any blocking system between the steam railway and the electric line.

I have laid out both structures and their approaches so that there would be no intersection at grade of any two kinds of traffic—an arrangement that not only increases materially the capacity of the bridges but also reduces to zero the possibility of accident from intersecting traffic.

Pedestrians are to be admitted to and taken from each bridge by stairways located near the high-water shore lines; and they should never be allowed to enter the highway-traffic road-ways. Jinrikisha men and those hauling carts, of course, should not be considered as pedestrians, but should be compelled to use the said roadways.

Ramps with grades not to exceed eight per cent. might be substituted for the stairways; but, whichever type of pedestrian approach be adopted, landings or resting place should be provided.

On sheet No. 3 is shown a cross-section of the Han river bridge, indicating that the highway traffic is carried at the upper level between the trusses and the sidewalks at the outside thereof, and that the railway traffic is cared for at the lower level by a steel floor-system suspended by telescoping hangars from the truss above. For the purpose of reducing to a minimum the total weight to be lifted by the electric machinery, the said floor-system should be manufactured of some high alloy of steel, such as nickel steel.

Grades.

In my opinion, the greatest allowable grades should be one per cent. for the steam-railway, five per cent. for the highways, and from five to seven per cent. for the electric tram-lines. The proper limit for the latter will depend upon a number of conditions; but any grade between these figures would be fairly economical in respect to both first cost and operation.

Live Loads.

For these structures I advocate the adoption of the following live loads as given in "Bridge Engineering":—

Steam railway	Class 60
Electric railway	Class 25
Highways (Floor system)	Class B
(Trusses)	Class C
Footwalks	Class C

Specifications.

For designing the substructure and the superstructure of these bridges I am of the opinion that it would be best to adopt the specifications, principles, and methods given in my "Bridge Engineering," but if, for any reason, the superstructure specifications of the American railway engineering association be preferred, there could be no valid objection to their adoption.

Materials.

I have figured on employing carbon steel for the entire superstructure; but later on it may be found more economical to employ nickel steel or some other high alloy of steel instead, especially for the moving span of the Yangtze river bridge and for the moving deck of the Han river structure.

For the railway floor I assumed the American standard practice of employing creosoted wooden ties and guard-rails with a narrow plank footwalk on each side for the use of employees only, the spaces between the ties not to exceed five inches.

For the highway floors I have adopted creosoted-block pavement four inches thick, supported on reinforced-concrete slabs about seven inches thick. In order to reduce the weight of this case to a minimum, I have estimated upon employing Haydite concrete, which effects a saving of some fifty pounds per cubic foot, as compared with ordinary concrete.

For the footwalks I have adopted four-inch slabs of reinforced Haydite concrete.

For the shafts of piers I have figured on using plain concrete, excepting that the copings thereof should be of dressed granite. As there is no ice in the river, there is no need for using granite facing for any portion of the piers.

For the bases of the piers sunk in deep water, I have estimated upon using timber shells filled with concrete up to an elevation of four feet below extreme low water; but for those sunk in shallow water or on a sandbar, I have adopted reinforced concrete for the shells, in order to avoid the employment of timber, which at Hankow would be quite expensive. It is necessary to adopt it for the deep-water piers, in order that the caissons may easily be floated into place.

Methods of Construction.

As all piers will reach bed-rock, at a depth not exceeding seventy feet at low water, I have adopted the pneumatic process throughout. It will be necessary to put down the caissons at comparatively low stages of water, although, after the sinking of a caisson is well started, it will be practicable to continue it, provided that the head of water does not exceed one hundred and fifteen feet.

Erection of spans should be done at comparatively high water by the method of flotation. The conditions for this at Hankow are quite favorable. I have employed the method extensively in my American practice on such rivers as the Fraser, the Williamette and the Columbia on the Pacific coast, and am figuring on so doing for the proposed Mississippi river bridge near New Orleans.

Unit Prices of Materials.

In determining the unit prices of materials in place I have used much deliberation; because, while I do not want to make the total cost so high as to discourage building, I cannot risk my hardly-earned reputation as a safe estimator by adopting figures that are lower than those which it would be found necessary to pay when letting the contract for construction. I made careful enquiries as to the cost of timber, piling, sand, brokenstone, granite masonry, cement, common labor, skilled labor, etc., at Hankow; and I guessed that the probable cost per pound for carbon steelwork delivered at Hankow would not exceed 4.25 cents gold, allowing for erection and profit thereon 2.0 cents per pound gold, making 6.25 cents gold erected, which is now equivalent to 11 cents Mex.

In proof of the correctness of this surmise I would state that a few days ago I received a letter from my New York office containing the information that it had just let the contract for a steel bridge at Trenton, New Jersey, at 4.6 cents per pound erected. Allowing one cent gold per pound for freight and 0.5 cent gold per pound for extra cost of erection at Hankow would bring the total to 6.1 cents gold, which is a trifle under the 6.25 cents that I had assumed.

For the average cost per pound of the machinery and wire ropes for the vertical lift, I had assumed 50 cents Mex.; and I am informed that at the before-mentioned Trenton-bridge letting, which structure will include a vertical lift span, the pound prices in gold that were tendered ranged from 15 to 20 cents for the main sheaves and from 22 to 30 cents for the operating machinery, equalizers and ropes. An average of these figures is 22 cents gold, which is now equivalent to 38.5 cents Mex., proving that my allowance was ample.

Estimated Quantities of Materials.

Upon the assumed profits of bedrock I have estimated carefully in detail, and have checked the quantities of copings, shafts, and bases of all piers, and those of all materials entering into the flooring of the superstructure. As for the weights of metal, I took them from the diagram on page 155 of my "Economics of Bridgework," which diagram was prepared from the estimated weights of carbon steel for various span lengths in my before-mentioned proposed Mississippi river bridge near New Orleans, the carrying capacity of which is exactly the same as that assumed for the proposed Yangtze and Han structures.

I am offering these statements in order to give you confidence in respect to the correctness of my estimates of cost, fearing that the remark made by my British colleague at a general board meeting of the Yellow river bridge commission may have reached your ears and prejudiced your judgment of my estimates. He stated that my estimates of cost for an economically designed bridge to cross the Yellow river would have to be greatly increased; because engineers' estimates were always too low, his own often having been exceeded by as much as one hundred per cent. My reply was that if my estimates of cost should be over-run by even a small portion of that percentage, I would soon be entirely out of work.

In America engineers *must* figure closely; and my estimates are very seldom over-run, and then only slightly. For instance, the last estimate I made before leaving New York was for the superstructure of a bridge consisting of three spans of three hundred feet each, the middle one being a vertical-lift span. My estimate of total cost was $620,000, and the lowest bid (which took the contract) was $619,000.

In the case of the before-mentioned Trenton bridge, let last month upon a falling market, the contract was awarded for a sum materially below our estimate of cost.

Estimates of Total Cost

My estimates of cost are as follows:

YANGTZE RIVER BRIDGE.

Substructure.

Copings 582 cu. yds. .. .. .. @ $ 40 =	$ 23.280
Shafts 48,568 cu. yds. .. .. .. @ $ 17 =	825,565
Bases with concrete shells 5,000 cu. yds. .. @ $ 33 =	165,000
Bases with timber shells 15,326 cu. yds. @ $ 42 =	643,692
Total cost of substructure	$1,675,628
Ordinary structural carbon steel, 51,450,000-lbs. @ 11 cents	$5,659,500
Machinery and ropes, 280,000-lbs. @ 50 cents ..	140,000
Flooring, 3,770 lin. ft. @ $ 120	450,000
Counterweights, 1,030 cu. yds. @ $ 25	25,750
Electrical apparatus and house	44,000
Total cost of superstructure ..	$6,319,250

Railway Approaches.

Steel, 4,400,000-lbs. @ 10 cents	$440,000
Flooring and pedestals, 1,750-ft. @ $30	52,500
Total cost of railway approaches ..	$492,500

Highway Approaches.

Steel, 1,800,000-lbs. @ 10 cents	$180,000
Flooring, 1,750 lin. ft. @ $ 70	122,500
Stairways	22,500
Total cost of highway approaches	$325,000

Grand Total.

Substructure of bridge	$1,657,628
Superstructure of bridge	6,319,250
Railway approaches	492,500
Highway approaches	325,000
Summation	$8,794,378
Engineering and contingencies, 10%	879,438
Total cost of Yangtze bridge and approaches ..	$9,673,816
Say	9,700,000

HAN RIVER STRUCTURE.

Substructure.

Shafts, 2,100 cu. yds. @ $ 17	$ 35,700
Bases, 3, 530 cu. yds. @ $ 33	116,490
Total cost of substructure	$152,190

Superstructure and Towers.

Ordinary carbon steel, 10,600,000-lbs. @ 11 cents	$1,166,000
Flooring, 640-lin. ft. @ $ 120	76,800
Machinery and ropes, 448,000-lbs. @ 50 cents ..	224,000
Counterweights 640 cu. yds. @ $25	16,000
Electric apparatus and house	80,000
Summation	$1,562,800
Highway Approaches (To Carry Also Electric Railway Trucks) and Stairways	$560,000

GRAND TOTAL.

Substructure of bridge	$ 152,190
Superstructure of bridge, and towers	1,562,800
Highway approaches and stairways	560,000
Summation	$2,274,990
Engineering and contingencies 10%	227,500
Total cost of Han river bridge	$2,502,490
Say	2,500,000

CONNECTING RAILWAYS.

Double-track railway with small stations, sidings, etc., complete, 5 miles @ $60,000	$300,000

TOTAL COST OF PROJECT.

Yangtze river bridge	$ 9,700,000
Han river bridge	2,500,000
Connecting railway line	300,000
Grand total cost of project	$12,500,000

ECONOMICS.

A study of the preceding estimates of cost might cause one to think that the layout of spans is not economic, because the cost of the superstructure is so much greater than that of the substructure. It is true that the adoption of shorter spans would reduce somewhat the grand total cost of the project; but I believe that it would interfere too much with navigation.

NECESSITY FOR MATERIALIZATION OF PROJECT.

In my opinion, the materialization of this project in its entirety, in the manner in which I have laid it out, is of paramount importance to the Chinese republic. The connection of the two great railroad system would be a link that would bind closely together North and South China, not merely by increasing trade between them, but by facilitating personal intercourse between the two sections of this great country, unhappily at present so divided. It would be a great pity to have the existing division continue indefinitely, for the results thereof would be just as disastrous as would have been those in America, had the attempted segregation of the southern states from the union proved successful.

Again, there are approximately two million inhabitants in the three closely-located cities at the mouth of the Han; and the only present means of communication between them is by water. In stormy weather it is exceedingly difficult, and occasionally totally impracticable, to cross the Yangtze at Wuchang; hence highway-bridge connection between the three cities would be a real boon, and would undoubtedly give a great impetus to the business of the entire district. The existence of the railroad connection would induce the establishment of new manufacturing enterprises in all three of the cities: and the draining of the shallow lake between the two rivers, before referred to, would provide ample space therefor—to say nothing of that which would be available along the banks of the Yangtze both above and below the suggested crossing.

The materialization of this project is as important a matter for the development of China as any that has ever been suggested; and patriotic Chinese capitalists would do well to give it immediate and serious consideration.

SUGGESTED METHOD OF FINANCING.

I am of the opinion that, as soon as the present upset condition of the financial world has changed for the better, it would be practicable to procure from American bankers the money needed for building the two bridges and the connection railroads. It would be necessary, though, for the Chinese government to guarantee the ultimate payment of both principal and interest, and to allow the bond-holders to operate the structures and collect the tolls until the debt is cancelled, the said tolls being applied to the payment of interest and to the refunding of the principal.

The highway travel over the bridges would be immense, were reasonable tolls adopted; and there should be a charge made for every loaded or unloaded car carried across by the railroads.

At present there should be considerable freight for the north from the territory traversed by the Hupei-Hunan section of the Canton-Hankow line; and as soon as the existing gap is completed, the amount of both freight and passenger rail-traffic over the bridge would be enormous.

Later on I might be able to be of service in securing American capital for this enterprise; and, if so, it would give me great pleasure and satisfaction to aid the Chinese government in that manner.

CONCLUSION.

In conclusion, permit me to offer the suggestion that this report be given to the Chinese institute of engineers and to the association of Chinese and American engineers for publication in their proceedings, from which it would undoubtedly be copied largely both at home and abroad, thus bringing the project to the attention of the financial world.

Trusting that this work which I am herewith completing will meet with your excellency's approval.

I remain, with great respect,

Yours faithfully,

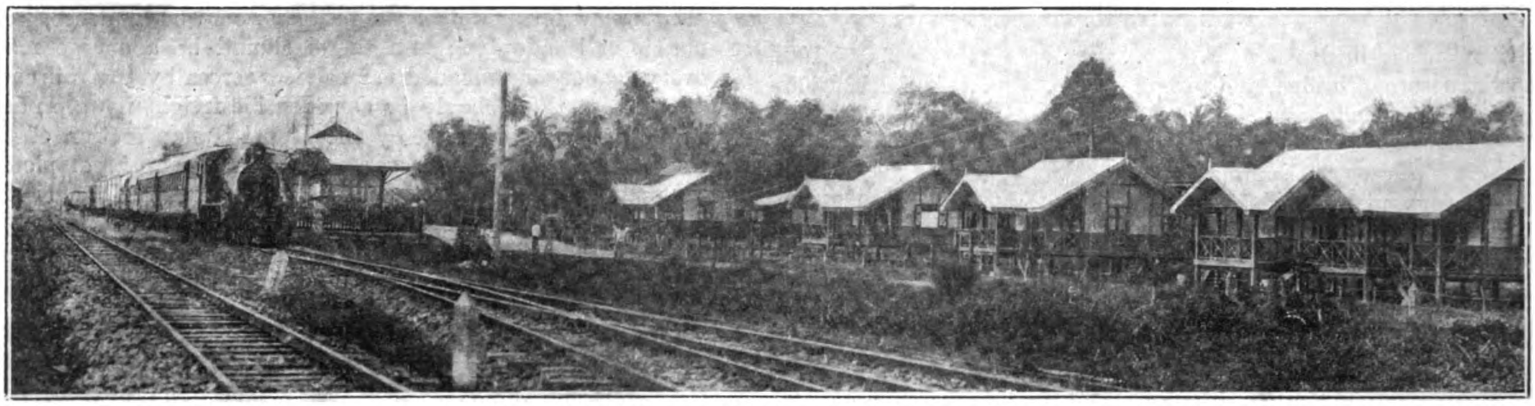
(*Sgd.*) J. A. L. WADDELL,

Consulting Engineer.

New Sino-Japanese Loans

IT is reported that Mr. Chang Chien, who is a leading business man in Nantungchow, an industrial town in the mid-eastern part of China, and who was formerly the minister of agriculture and commerce, is now interested in a movement for the raising of three private loans in Japan, that is, one for Yen 30,000,000, another for Yen 15,000,000, and a third for Yen 8,000,000, for the purpose of starting land exploitation and irrigation schemes in the south-eastern region of Kiangsu, between Nantungchow and Hweichow, and also for the development of the spinning industry in Nantungchow, in which Mr. Chang is concerned. It is said that three delegates of Mr. Chang are now in Japan and are negotiating with Japanese capitalists belonging to the Japan-China business association through Viscount Shibusawa, and that the Japanese investors are rather favorably inclined to the proposal.

Strangely, however, this proposal is said to be exciting considerable opposition among the Chinese people, and Mr. Chang is reported to be having a difficult time in explaining his position to them. We are puzzled to understand why the Chinese people are opposed to the idea, unless it is merely due to the usual anti-Japanese sentiment. It may be that they fear these loans will lead to the destruction of sovereignty in China, but it is impossible that a purely private and genuinely economic loan for the development of the land, which is bound to result in the promotion of the interests of the local people, should prove dangerous to the sovereignty of the country. On the contrary, history most clearly shows the tremendous public benefit, which similar loans have brought to the people of China, as in the case of the Wei Ho conservancy loan, which was signed in April, 1916. This loan, at first, originated from the importation of $20,000,000 gold from America on the security of the land revenue, the river-improvement tax, and the canal transit duty in the province of Kiangsu, as the result of negotiations between Mr. Chang and Dr. Reinsch, American minister to China, who at the time was a representative of the American red cross society. Later the Siems-Carey Railway & Canal Company of America and the Industrial Bank of Japan jointly invested $6,000,000. So far as our knowledge goes, this has so far not affected the sovereignty of China in the least, nor can it ever do so in the future.—*Osaka Mainichi.*

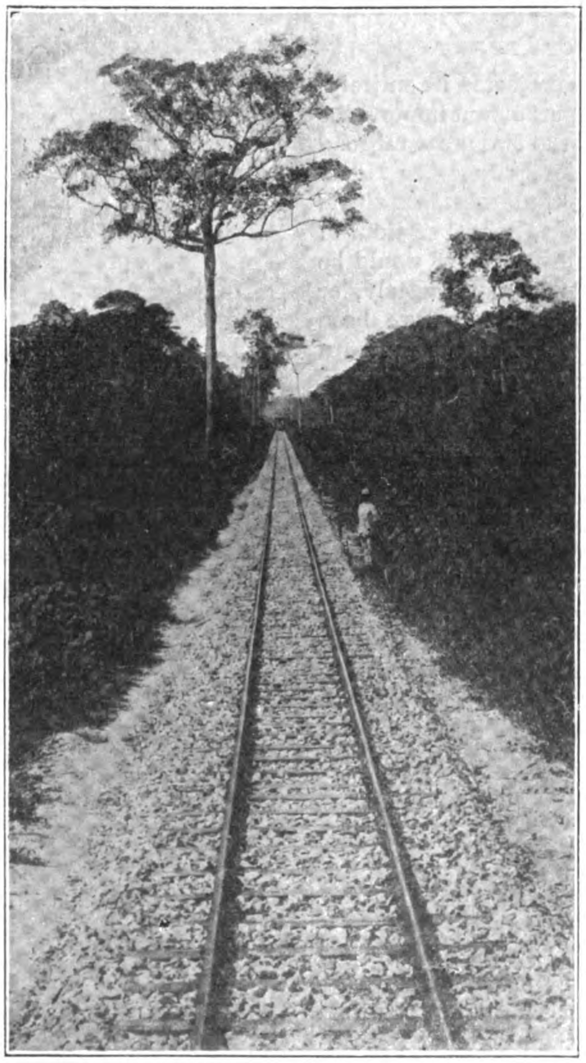


Siam State Railways: A Station on the Southern Line

Siam State Railways' Building Program

CONSTRUCTION work which will make it possible to travel from Bangkok to some of the most remote parts of the kingdom of Siam is now being carried on by the Siam State Railways. It is hoped that within the near future it will be possible to travel from Penang and Singapore through Siam to the principal cities on the French system in Indo-China without the change of cars. A ten-year program outlined by the railways includes (1) the conversion of the northern, north-eastern and eastern lines from standard to metre gauge, in order to be uniform with the gauge adopted by the neighboring countries and of the Siamese southern line, (2) the linking up of the systems on the east and west banks of the Menam Chao Phya by a bridge across the Menam, (3) the extension of the eastern line from Petriew to Aranya Pradesa, 5.9 kilometres from the Cambodian boundary, and (4) the extension of the north-eastern line from Korat (Nakorn Rajasima) to Ubol, a city not far away from the Mehkhong river.

The move to make the entire Siamese system into a metre gauge railway has for its purpose the ultimate union of the various railways throughout south-eastern Asia. The F.M.S., French Indo-China and Burma railways are all of the metre gauge and by making the Siamese lines conform, Siam will weld an important link in the chain of railways which in time will carry the traveler from Singapore via Bangkok and Hanoi to Yunnan, and from Mandalay via Rangoon and Moulmein to Saigon.



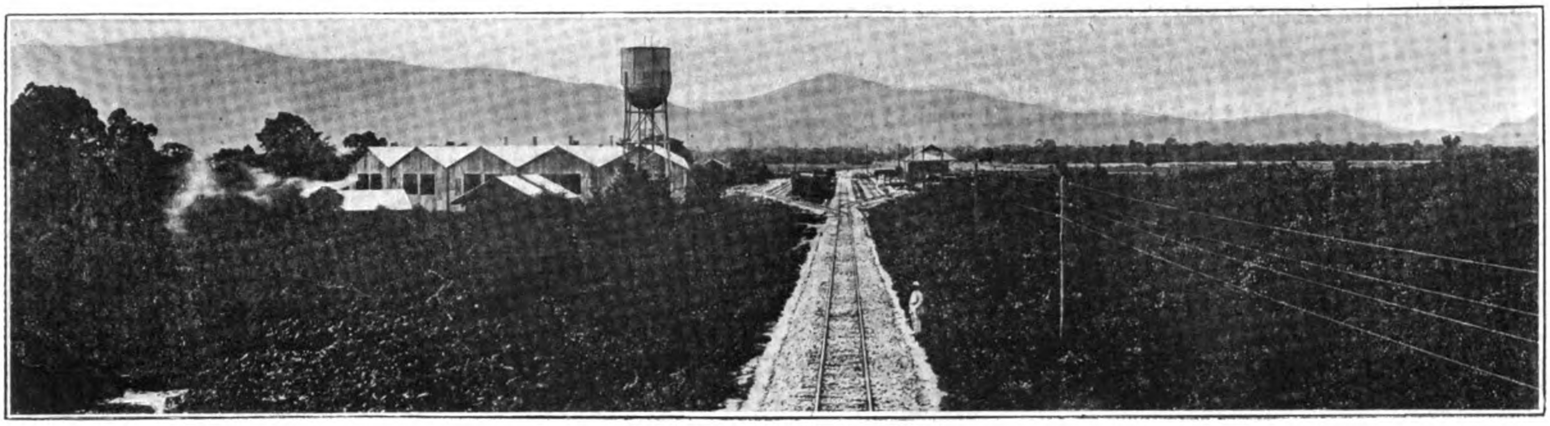
A Completed Section of the Southern Line

The southern line, from Bangkok Noi to Padang Besar and Sungei Golok the stations on the borders of Kedah and Kelantan respectively and the system east of the Menam were originally separate railways, and were not united until July, 1917, when they were put under the administration of the present Commissioner General, H.R.H. Purachatra, the prince of Kambaeng Bejra. The standard gauge lines composed the first railways, and were started in 1892 with the building of a line from Bangkok to Ayudhya (71 kilos.) completed in 1897. The last piece of standard gauge track to be laid was the section from Pang Yang to Chiengmai, which, on January 1st, 1922, was opened to traffic, completing the line of 756 kilometres from Bangkok north. The total length of standard gauge lines is 1025 kilometres. In the year ending March 31st, 1921, the standard gauge lines yielded a net profit of Tcs. 2,735,575, a return of 4.51 per cent. on the investment of Tcs. 60,602,610. The gross receipts for the year were Tcs. 5,787,090.

The southern lines were projected in 1909 and a second railway department organized to build and administer the metre gauge railways down to peninsula. Through service between Bangkok and Penang was first started in 1918, three days being required for the trip. On January 1st, 1922, day and night coach and restaurant car service was introduced on this line, and the weekly express now makes the trip in 34 hours. In 1920-21 the southern lines earned a net profit of Tcs. 1,285,-187, a return of 1.99 per cent. on the investment of Tcs. 64,453,190.

The decision to unify the gauge of the two parts of the system was made on the 8th September, 1919. The conversion of the standard gauge lines to metre gauge is being accomplished by laying a third rail between the existing rails, the outer rail will eventually be taken up. A set of double points and crossings with suitable switches was designed by the engineers of the technical office of the department of state railways, and practical trials made. The actual work of laying the third rail on the eastern and river lines was begun November 20th, 1920. The conversion of the eastern and north-eastern lines is now completed, and metre gauge rolling stock is used from Bangkok to Petriew and from Bangkok to Korat.

The extension from Petriew to Aranya Pradesa at the Cambodian border has been completely surveyed, and will have a total length of 193.2 kilometres. The line has been cleared and earthwork completed on the first section of 99 kilometres. On the remaining



Ootahao Station, Southern Line

section on account of the scarcity of labor it has been decided to carry out construction by machinery, thus doing away with the large manual labor required and reducing sickness and mortality among the laborers working in an unhealthy district to a minimum. At present a large number of the most up-to-date machines have been imported from America for this work. Up March to 31st, 1921, Tcs. 3,965,042.34 had been expended on this extension. The estimated cost when completed is Tcs. 13,542,672.

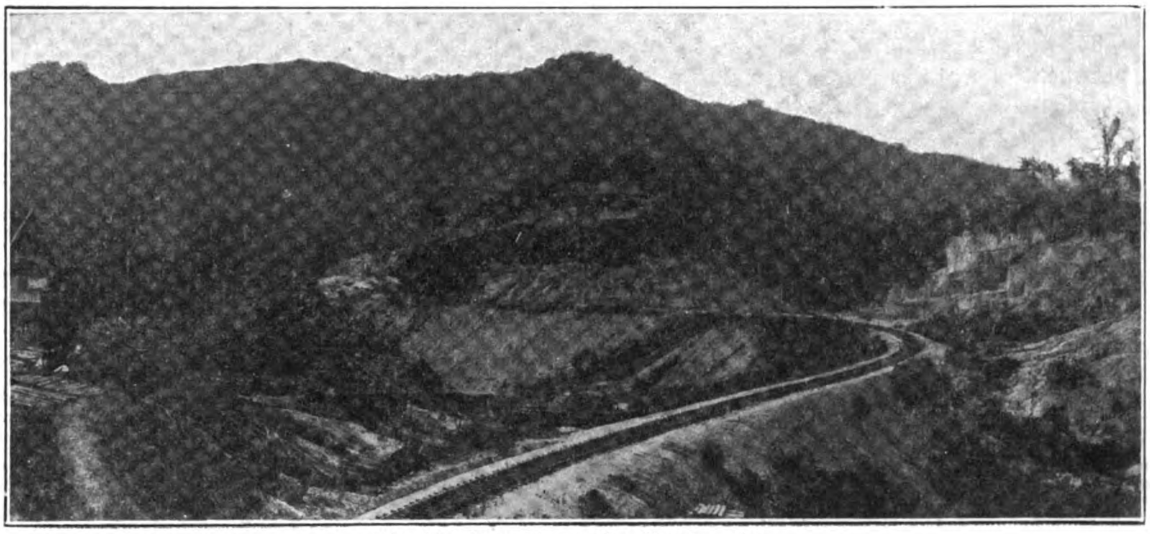
Aranya Pradesa will for the present be the terminus of a first-class motor road to the world famous Angkor Wat and via Pnom-Penh, the capital of Cambodia, to Saigon.

The survey of the north-eastern line extension from Korat (Nakorn Rajasima) to Ubol shows the total length to be 312 kilometres. A section of 147.95 kilometres has been cleared and earthwork on this section was on the point of completion. The expenditure to the end of March, 1921 was Tcs. 734,770.18.

The contract for the bridge across the River Menam was awarded to the firm Daydé of Paris, who constructed the Pont Doumer over the Red river in Tongkin.

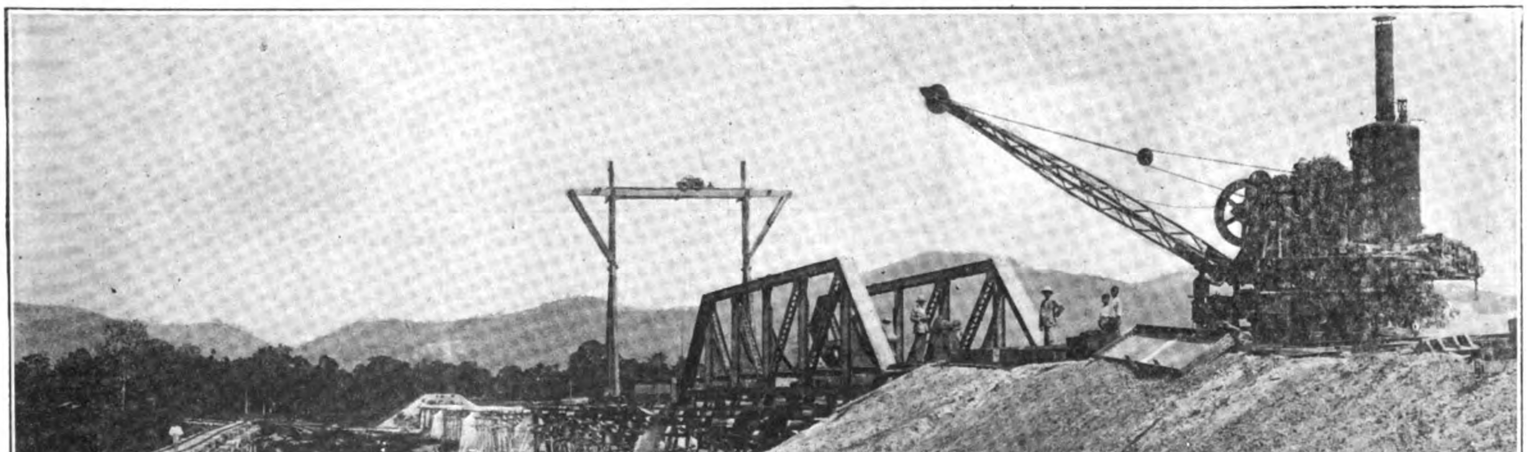
The east branch of the southern line, from Haad Yai to Sungei Golok, connecting with the east coast line of the F.M.S. railways and giving through service to Hhota Bahru in Kelantan, was opened for traffic in November 1921. The length of this branch is 210 kilometres and cost Tcs. 11,473,704 to build. This line will in the future be the alternative route to Singapore.

Arrangements have been made to open through service on the northern line this November. At present the journey from Bangkok to Chiengmai is made in three stages, passengers being required to spend two nights in railway resthouses *en route*. When sleeping and restaurant cars are placed on this run, the continuous running time will be reduced to 26 hours.



The Northern Line under Construction

Since 1918 the administration of the rural highways has been placed under the commissioner general of railways. This arrangement allows for a consistent scheme of transportation, whereby the road system will be made to supplement the rail and waterways of



Erection of Steel Bridge on the Patani Section of the Southern Line

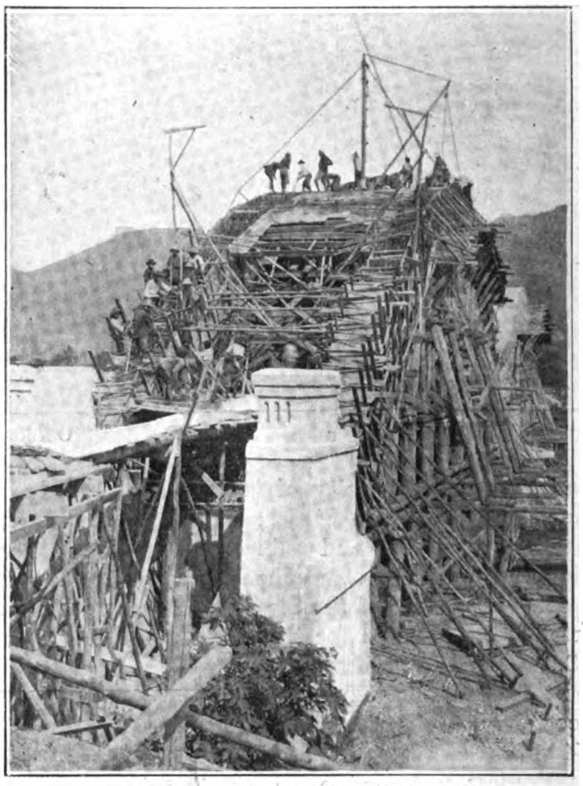
Siam. Roads are made to act as feeders to the railways at important centres.

The development of road building has not yet reached a standard set, as for instance, by French Indo-China. Outside the cities there are few first-class roads in Siam, principally for want of funds. Although there are 3,676 kilometres of roads under the direct control of the department of ways, only 83 kilometres, the road between Songkhla (Singora) and Sadao, a village near the Kedah border, is ranked as first class.

The department of ways keeps a careful census of traffic on the various roads of the kingdom, and ranks each road according to the traffic it must bear. Upon the class of the road depends the appropriation which will be spent in its maintenance. Whenever traffic on an inferior road increases sufficiently, the road is reclassified and resurfaced with better material.

From the year 1919 to March 31st, 1921, Tcs. 3,515,984 53 had been spent by the department of ways. Of this amount Tcs. 1,233,464.11 was expended in road construction, Tcs. 1,365,365.79 for improvement, and Tcs. 751,604.36 for maintenance.

The total length of state roads under the direct control of the department of ways at March 31st, 1921 is analysed in the following table :—



Another View of Same Bridge

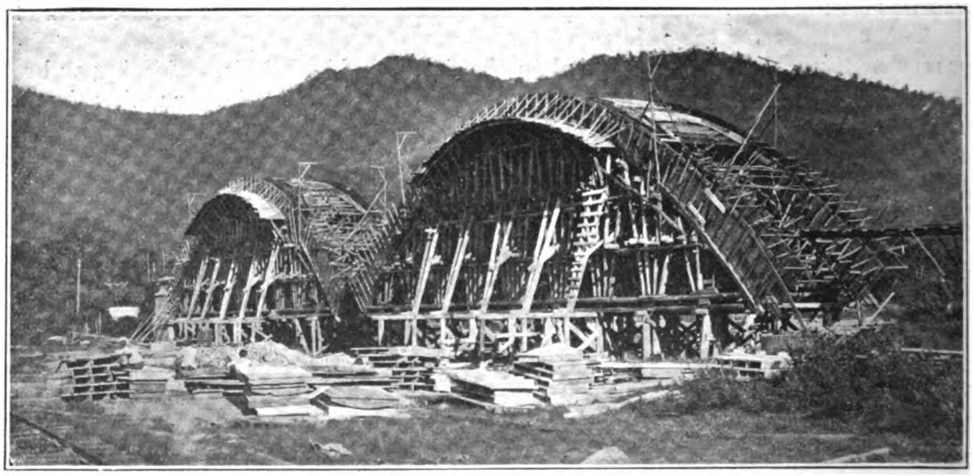
Division	Under Maintenance					Under Improvement					Under Construction					Total per class					Total
	I	II	III	C.T.	B.P.	I	II	III	C.T.	B.P.	I	II	III	C.T.	B.P.	I	II	III	C.T.	B.P.	Kms.
Northern	—	57	39	—	—	—	—	45	34	—	—	—	206	39	—	—	57	290	73	—	420
Central	—	—	—	—	—	—	—	—	1,936	—	—	—	47	112	—	—	—	47	2,048	—	2,095
Southern	83	43	30	—	—	—	—	193	400	—	—	14	183	215	—	83	57	406	615	—	1,161
Total B. E. 2463	83	100	69	—	—	—	—	238	2,370	—	—	14	436	366	—	83	114	743	2,736	—	3,676
Total B. E. 2462	—	4	—	—	—	83	96	279	2,370	—	—	—	459	276	—	83	100	738	2,646	—	3,567

N.B.— I First Class Road
— II Second Class Road
—III Third Class Road

C.T. Cart Track
B.P. Bridle path.

Buddhist Era 2464 is the period from April 1st, 1920 to March 31st, 1921

In all their work as regards the question of transport the Siamese have shown great energy and efficiency and it is hoped that at no distant future the whole kingdom will be covered by a network of roads and railways to cope fully with the requirements of the country, but the lack of funds has been their greatest drawback, hence the full program, which is not given out to the general public, has had to be cut down to utilize only the grant now placed at their disposal.



Reinforced Concrete Railway Bridge under Construction in Northern Siam

Siam Railway Orders

The tender of the Cravens Railway Carriage and Wagon Co., Ltd., of Sheffield, represented in Siam by the Anglo-Siam Corporation, Ltd., for the supply of 25 under-frames for railway carriages and 50 bogies and spare parts, has been accepted by the department of state railways. The contract price is £15,309 15s. f.o.b. Middlesbro.

The East Asiatic Co., Ltd., acting on behalf of the Société Anonyme John Cockerill of Belgium, were the successful tenderers for the supply of 11,000 tons of steel rails and accessories, at a price of £112,537 11s. 4d. c.i.f., including handling and stacking on railway premises and demurrage charges for delay of steamers.

大正七年七月十日第三種郵便物認可

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Tientsin's New Power Station

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Vol. XIX | November, 1922 | No. 11

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High-Duty Metal is the best mixture we have yet evolved to combine strength, ductility, density and hardness.

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FIG. W3253
GLOBE CHECK VALVE

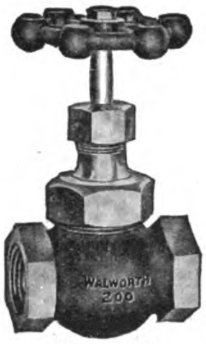

FIG. W3251
GLOBE VALVE

FIG. W3261
FLANGED GLOBE VALVE

FIG. W3252
ANGLE VALVE

They can be reground on the line without disconnecting.

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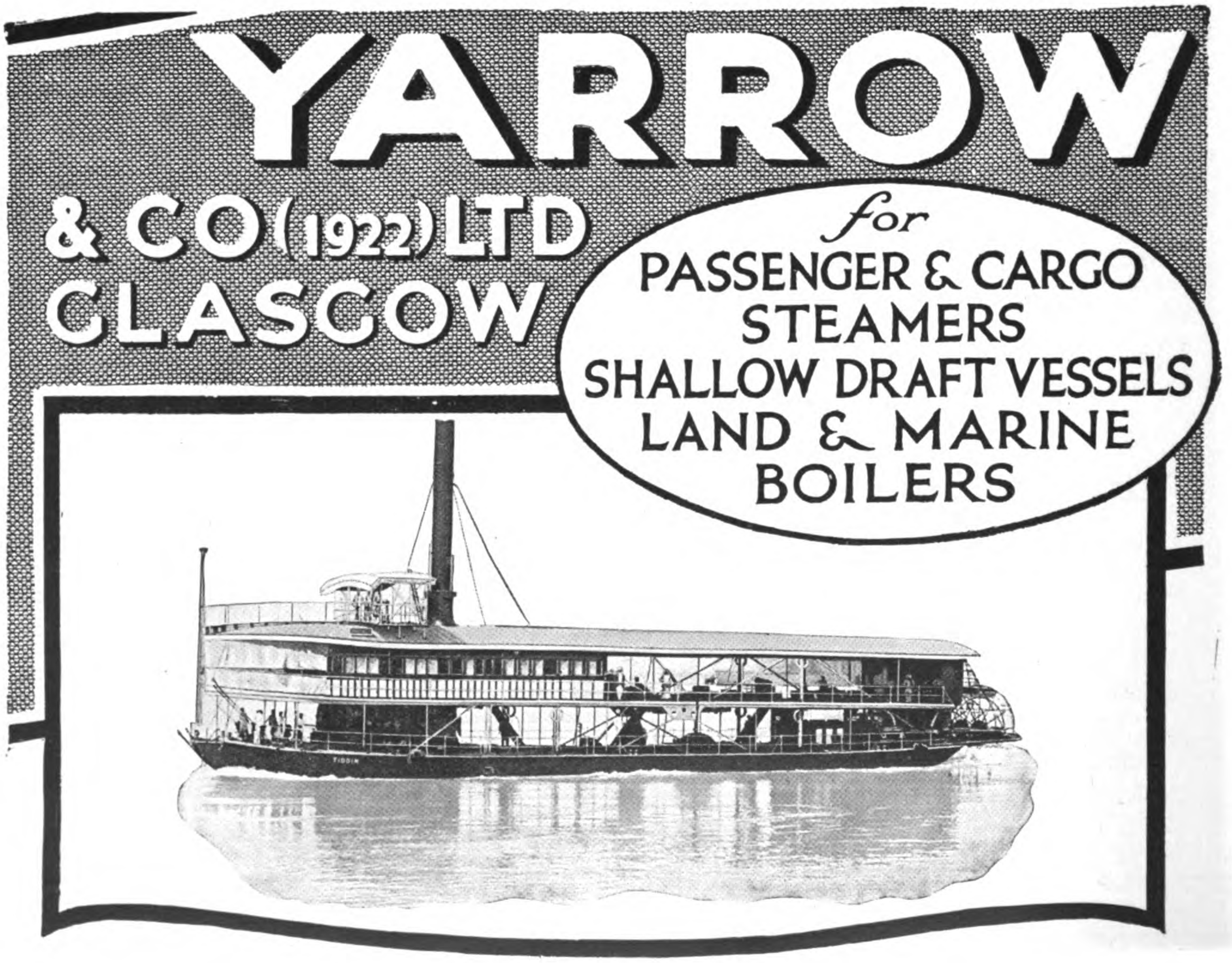

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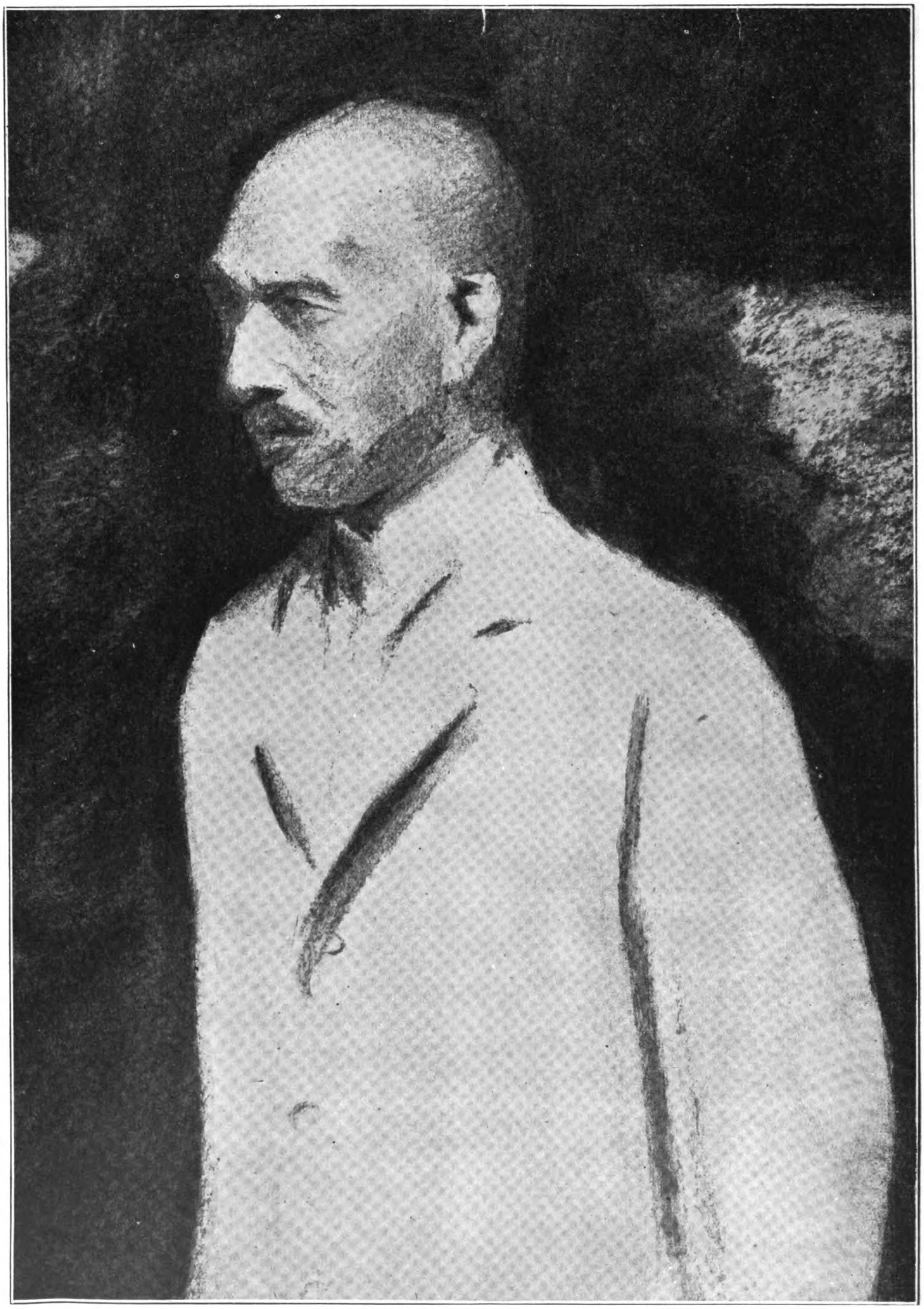


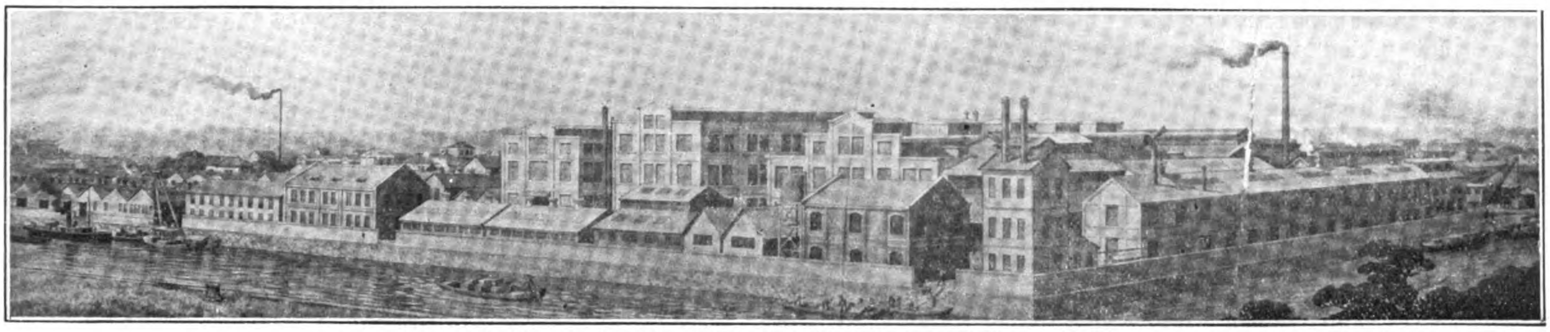
TOROKICHI OBATA

After a most strenuous term as Japan's minister to China, Mr. Torokichi Obata is to be transferred to another post. Probably no contemporary diplomat has had to face such difficult and intricate problems as has fell to the lot of Mr. Obata in his four years of service at Peking. His efforts to bring about a better understanding between China and Japan were often thwarted by the military leaders of his own government, the opposition of public opinion in China, and the intrigue of other powers.

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, NOVEMBER, 1922 No. 11



General View of the Shibaura Engineering Works, at Shibaura, Tokyo

Linked with America in Big Industry

Success of the Shibaura Engineering Works

JAPAN is leading the world to-day in the expansion of her electrical industries, developing her water powers, electrifying her mills and machine shops and bringing the rural districts into close communication with the towns by means of electric tramways. At the end of 1920 there were 831 hydro-electric companies holding licenses from the government to develop 7,404,000 kilowatts but actually producing 1,254,000 kilowatts. Enterprises not yet in operation were licensed to develop another 2,756,000 kilowatts, and licenses applied for, to develop 3,394,000 kilowatts. Many of these companies have since been merged into larger combinations and many new plants completed and brought into operation. As a consequence of this development, the demand for electrical machinery and supplies has advanced by leaps and bounds and although a fair percentage of the orders have been placed with foreign manufacturers, by far the greater part of the equipment has been manufactured at home. There are now fifteen or more large works in Japan constructing dynamos of over 1,000 k.w., the largest being the Shibaura, the Hidachi, the Mitsubishi and the Okamura companies.

Of these the Shibaura Engineering Works are undoubtedly the largest builders of electrical machinery. The history of this company dates back to 1875, when Mr. Hisashige Tanaka, a well-known organizer of that time, started a machine shop at Shibaura in Tokyo, under the name of the Tanaka Works. The enterprise was on a very small scale, but such as it was, it attained a high reputation for the excellence of its work. The shops were developed year by year to keep pace with the increasing demand for machinery, until in 1893 they came into possession of the Mitsui family, who changed the name to the Shibaura Engineering Works and placed them under the direct management of Mr. Raita Fujiyama, at that time attached to the industrial department of the Mitsui family. This great organization backed the new enterprise in every way and by dint of constant and painstaking efforts built up the works to its present enviable position in the engineering world.

THE PIONEERS IN AMERICAN-JAPANESE CO-OPERATION

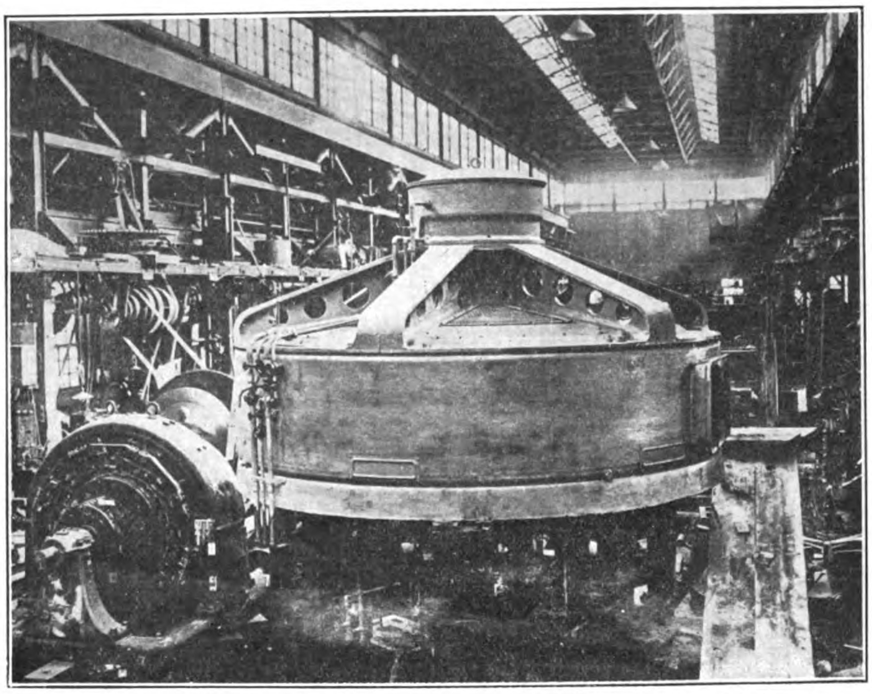
Dr. TAKUMA DAN
Managing Director of the Great Mitsui Interests and Director of the Shibaura Engineering Works.

Mr. J. R. GEARY
Representative of the Gen. Electric Co. in Japan, President of the Tokyo Electric Co. and Director of the Shibaura Eng. Works.

Mr. Fujiyama was succeeded in 1896 by Mr. Tomojiro Ono, and the latter by Mr. Genkichi Wakayama. The works were then operated as a department of the Mitsui mining department. He was followed by Mr. Nishimatsu and Mr. Otaguro. The Russo-Japanese war gave a strong stimulus to the works, which all this time specialized in the manufacture of electric generators, motors and transformers, in which the company's experts made steady and commenadable progress. The period between 1900-1901 was the beginning of an experimental stage during which

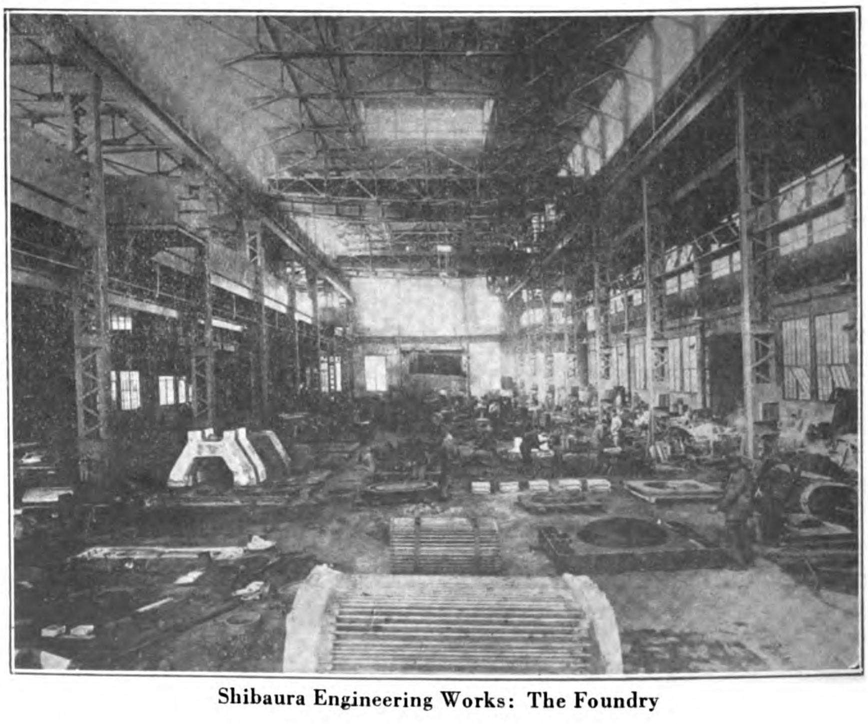
the company launched out into the manufacture of large units building a 200 horse-power motor and extending these experiments by making larger generators, transformers and other appliances. Emboldened by these successes, the works were reorganized in 1904 into a limited liability company with a capital of Y.1,000,000 with the members of the Mitsui family as shareholders.

Under the new control, many improvements were made and an up-to-date factory erected in 1908. During this period the engineers of the company were unusually active in designing and inventing new machines and appliances and in developing the home market for their specialities. Nearly every large engineering plant in Japan was supplied during that period with generators, water wheels, and boilers from the Shibaura Works. In 1910, the Shibaura Engineering Works made the step which brought it at once into prominence as the most advanced electrical concern in Japan and initiated that close co-operation with Americans which has since been the model for other American-Japanese combinations. In this year, an arrangement was entered into with the General Electric Company of America for the use of their patents in Japan on a co-operative basis, in which the American company was allotted one-third of the stock of the Japanese company. This agreement has brought most satisfactory results to both parties, and expanded the business in Japan to a point where the number of employees was increased from a few hundred to over 4,500 at the present time, and the size of generators has increased until now the works are turning out 7 to 8,000 kilowatt machines and larger, with a corresponding increase in motors transformers, and other accessories.



Shibaura Engineering Works: The Electric Rotary Machine Shop

This achievement was largely due not only to the foresight and business instinct of the Mitsui family, but to the activities and enterprise of Mr. J. P. Geary, the representative in Japan of the General Electric Company. This gentleman has always been a firm believer in the business capacity of the Japanese, holding that they can attain as high a standard of industrial production as any people in the world. In this he has been fully justified, not only by his own experience with the Tokyo Electric and Shibaura Engineering Works but in other well-known instances, where the Japanese have demonstrated that they are capable of being educated to the highest plane of engineering science and manufacturing ability.



Shibaura Engineering Works: The Foundry

In inviting attention to the possibilities of co-operation between Americans and Japanese, Mr. Geary cites his own experience as a guide to what may be accomplished along other lines. Interviewed on this subject he recently said:

" When I came to Japan in 1903 I became acquainted with the late Dr. Fujioka, who may be called the father of electricity in Japan, since he was instrumental in bringing to Japan from the United States some years before the first electrical apparatus used in this country. The doctor explained to me the details of the small lamp factory he was operating in Tokyo and asked me if there was not some way by which he could get manufacturing and financial assistance and technical information regarding the manufacture of lamps from the General Electric Company in America.

" After some negotiation I succeeded in getting the president of the company, in 1905 to permit me to make a cash investment of 100,000 yen in that small company, whose capital was then 200,000 yen. This was increased to 400,000 yen on our taking an interest in it. The number of employes at that time was about 100; the capital is now 10,000,000 yen and the number of employes 3,500.

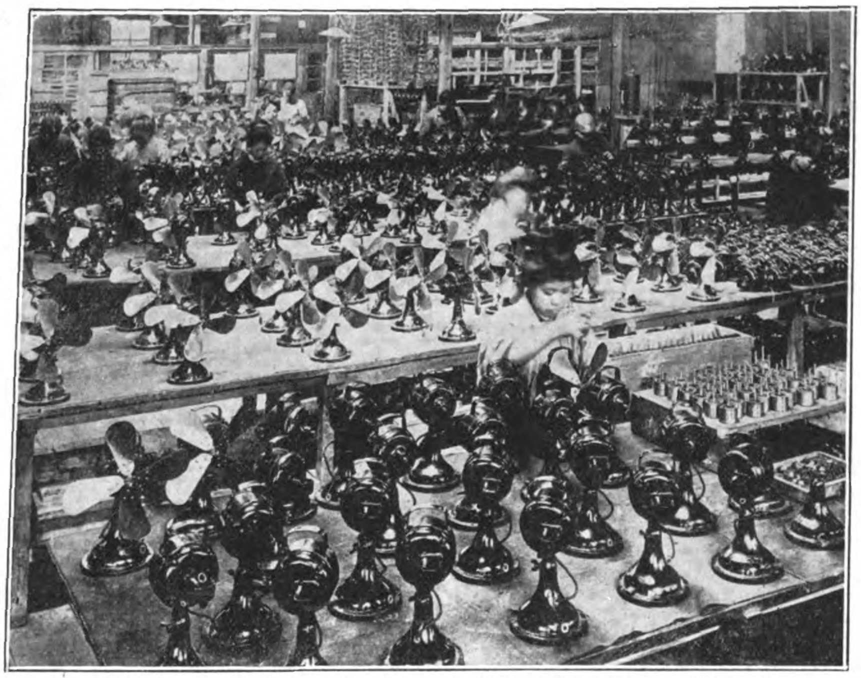
" That is the net result of American-Japanese partnership in the lamp manufacturing business in Japan. The growth of the Tokio Lamp Company followed the tremendous increase in the electric lighting business from year to year, because they were able to supply lamps of home manufacture which quickly replaced the previously imported article. The changes in the methods of manufacture and in the lamp itself have been very marked during these years, and it was therefore necessary for the Japanese lamp factory and the Japanese lamp engineers to keep in close touch with progress in America.

" To accomplish this a number of the Japanese engineers of the Kawasaki factory have been and are now spending several months each year in the lamp factories of the General Electric Company in the United States. In addition to this, a small laboratory was started at the Kawasaki plant so that the Japanese engineers themselves could take up original research work. This has grown to be a

important department of the business and the investigations conducted by these Japanese engineers have been favorably commented upon by the engineers of the Japanese imperial army and navy, by the doctors of science and professors of the Tokio Imperial University, as well as by E. W. Rice, Jr., the present president of the General Electric Company, who is also an engineer and scientist of distinction.

"The Tokyo company has from time to time during the last few years made co-operative arrangements with small lamp manufacturing companies, granting them licenses to manufacture and sell under the patents of the General Electric Company which are owned in Japan. These arrangements have proved highly beneficial, satisfactory and profitable to the smaller companies and have helped to develop the business of electric lighting in Japan.

"The welfare of the employes and operatives of the Tokyo company has from the first been a matter of concern to its management. Fair wages have been paid and in addition to these a bonus has been distributed at the end of each term, based upon the profits earned and the record for good work borne by individual employes. A system has been established of service debentures with guaranteed interest returns for the benefit of deserving employes of long service in the company.



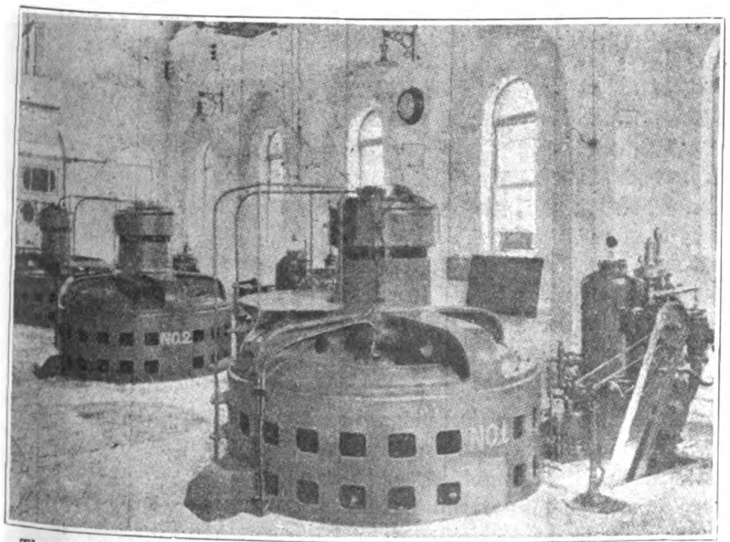
The Electric Heating Appliance and Fan Motor Shop of the Shibaura Engineering Works

"Continuous welfare work has been conducted at the expense of the company for the conservation of the health of their employes, for the improvement of their living conditions and for assistance in case of illness or death. Provision has been made for rest rooms and club rooms at the works, and hospital attendance has been available at all times. More than this, the company has felt impelled to extend assistance to its employes in the purchase of food and clothing and in the matter of housing so as partly to offset the prevailing high cost of living.

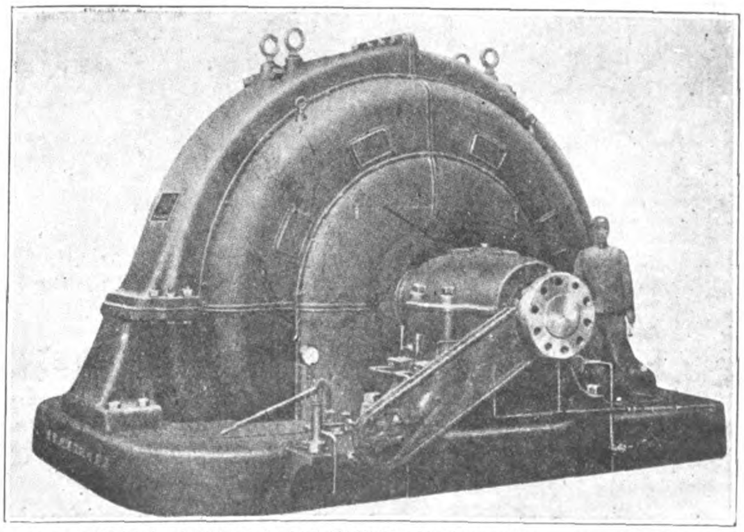
"The proof that all this has been a remunerative investment is to be found in the fact that the Tokyo company has been able to maintain a reasonable rate of dividend for the past ten years and also to sell its product at a lower price than incandescent lamps can be purchased in any other country in the world. Be it remembered that the entire staff of the company is Japanese, from the office boy to the president.

"In the Shibaura Engineering Works there has been a similar example of co-operative management with equally satisfactory results. Here there were but a few hundred employes fifteen years ago, while now the maximum is about 4,500, and generators of 7,000 to 8,000 kilowatts can be manufactured. Practically the same arrangements have been made as in the case of the lamp concern with the General Electric Company. That is to say, the new improvements, the patent rights and manufacturing details and methods automatically pass from one company to other. The Shibaura engineers have free access to all departments of the apparatus factories of the General Electric Company in America, and a number of them are constantly stationed there for the actual investigation and study of our processes.

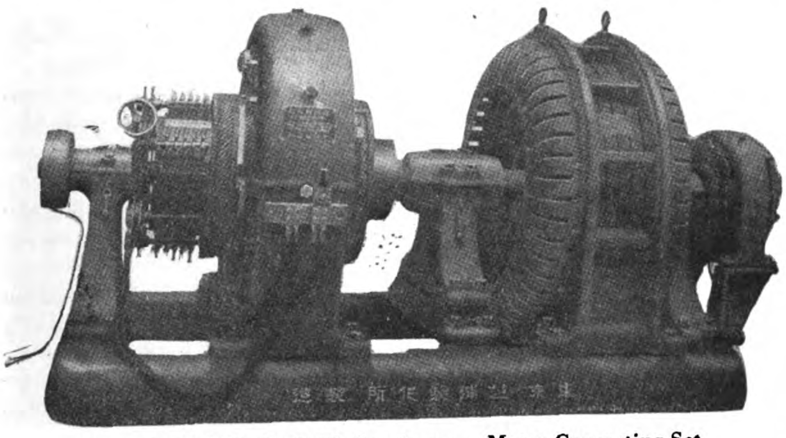
"The electrical business has grown to be a very large and very important industry in Japan, the capital invested is over 2,000,000,000 yen, and the kilowatts generated are at present over 1,000,000. There is still over 1,500,000 horse-power which may be generated by unused water power. The capacity now under way to be generated by both steam and water power must aggregate at least 400,000 kilowatts. These new plants will probably be completed



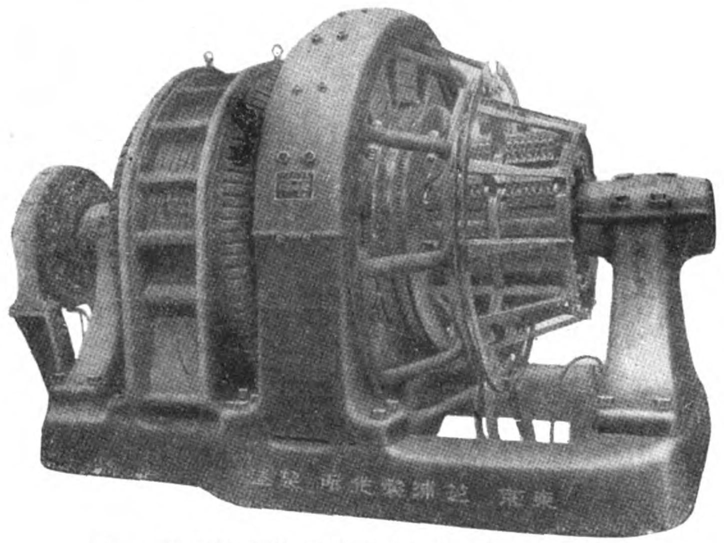
Three 1,875 K.V.A. 11,500 Volt 500 R.P.M. 50 Cycle Vertical Shaft Generators built by the Shibaura Engineering Works for the Wakayama Hydro-Electric Co.



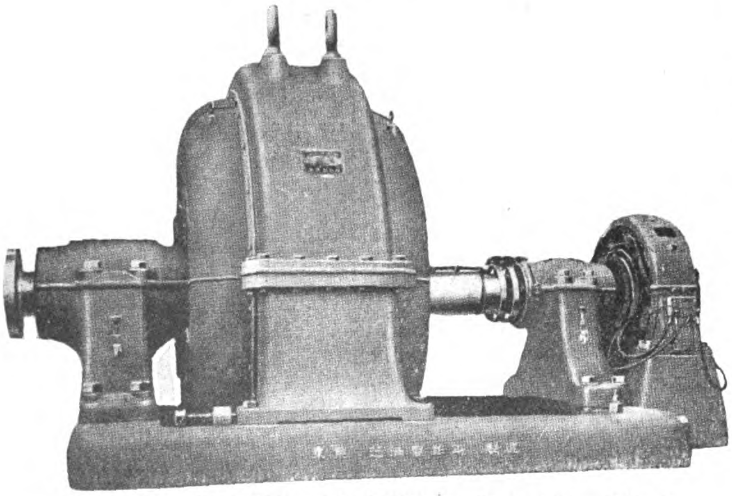
6,666 K.V.A. 6,600 Volt 375 R.P.M. 50 Cycle Generator, Enclosed-Ventilated for the Inawasiro Suiryoku Denki Kaisha built by the Shibaura Engineering Works



Type of 450 H.P. 300 K.W. Synchronous Motor Generating Set



Type of 1,500 H.P. 1,000 K.W. Synchronous Motor Generating Set: 500 R.P.M: 6,000 Volts Motor: Generator 250 v. 4,000 amp



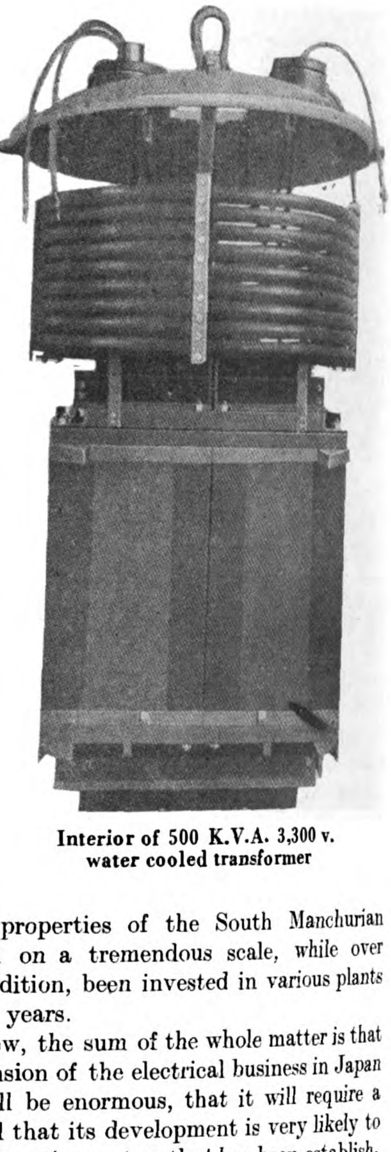
3,000 K.V.A. 7,000 Volts, 600 R.P.M. 50 Cycle Water Wheel-driven Generator, enclosed ventilated type, built for the Tokyo Electric Company

during the next three or four years, and the number of persons already employed in all branches of the electric industry in Japan is over 30,000. That, you must admit, bespeaks the existence of a fairly respectable degree of capacity from the lowest grade of employee to the highest.

"It has been found that the education of the electrical workers in the shops reaches a higher standard than in most other industries because of the qualities which the work demands. Now, it seems to me that in discussing the possibility of a better understanding and more intimate acquaintance between the people of the two countries, it is well to remember that these can be most readily attained by personal contact, business partnership and mutual financial interest. As I have said, the partnership between Americans and Japanese in the electrical business is no mere experiment; it has been attended with unvarying success for the fifteen years of its existence and with marked financial benefit to both parties.

"The possibilities of the future development of this form of American-Japanese co-operation are very great indeed. This statement applies not only to Japan, but to Siberia, Manchuria, Mongolia, Korea, China and even to countries further south. None of these are manufacturing countries, and it is my fixed opinion that Japan, with its manufacturing experience, is destined to be foremost in the electrical development of all this vast section of Asia. In Manchuria,

2,000 K.V.A. 66,000 v. water cooled transformer



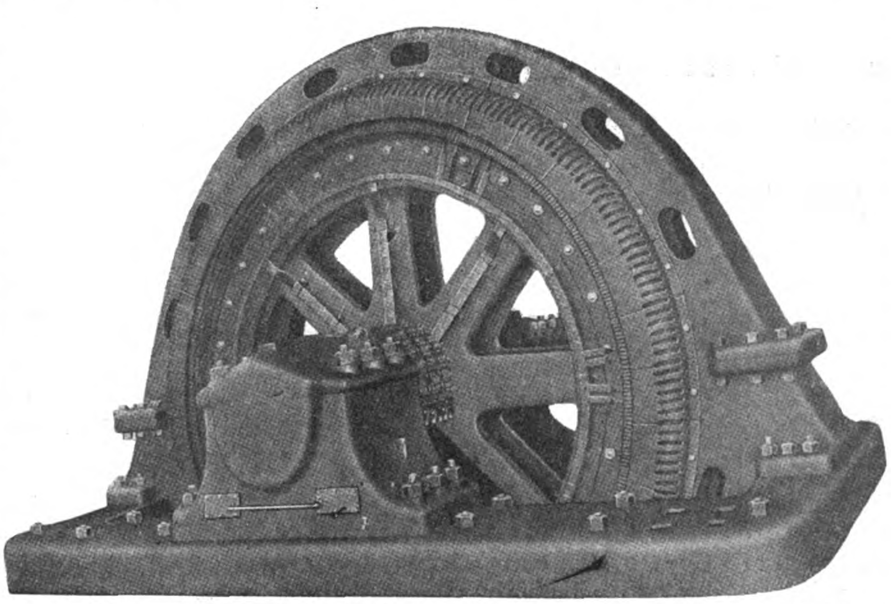
Interior of 500 K.V.A. 3,300 v. water cooled transformer

the electrification of the properties of the South Manchurian Railway has been effected on a tremendous scale, while over 30,000,000 yen have, in addition, been invested in various plants in China during the last few years.

"From our point of view, the sum of the whole matter is that in the near future the expansion of the electrical business in Japan in the nearby countries will be enormous, that it will require a great amount of capital and that its development is very likely to be along the lines of the co-operative system that has been established and made workable between Japanese and Americans in manufacturing companies here. In other words, the experience of the past affords the best possible guarantee that future partnerships on even a much larger scale can be formed and successfully maintained."

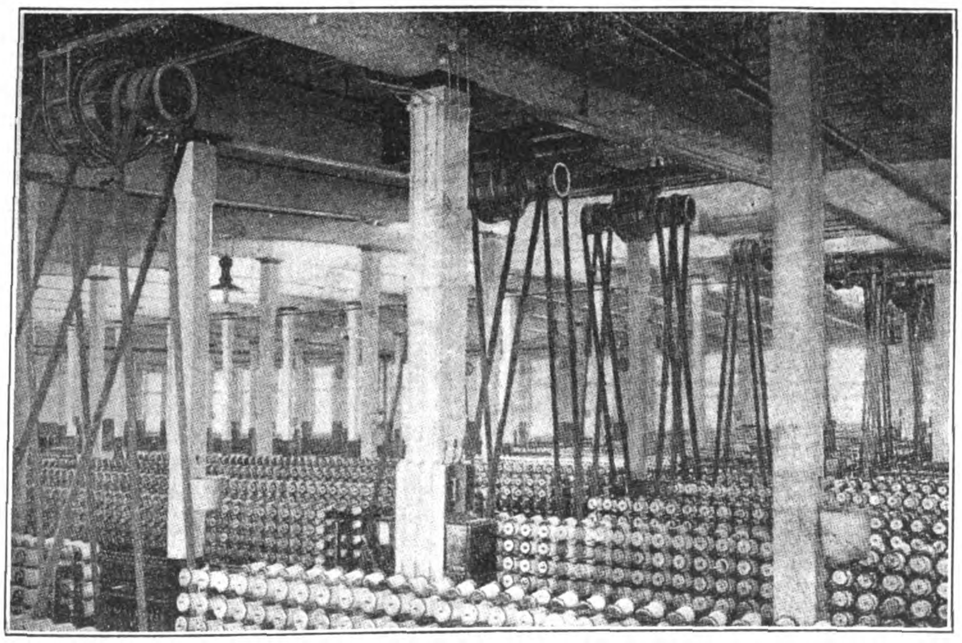
Under such close and harmonious co-operation, the business of the Shibaura Engineering Works has increased to a point where it is now filling more than seventy per cent. of the demand in Japan for electrical machinery and has extended its markets to China, Siam and the other Eastern Asiatic countries and islands. The decisive step taken in 1911 to confine itself to the development of electrical machinery and appliances was the turning point in its career of prosperity. At that time, due to its limited plant and

the slow growth of electrical undertakings in Japan and the preference for imported machinery, the company's scope of activities was somewhat curtailed, but since the date of its entering into a co-operative agreement with the largest American electrical machinery manufacturer, its growth has been rapid and assured. In quality and operating efficiency, their products took a foremost place in the electrical world and when the European war broke and the importations from other countries were cut off, the works experienced a remarkable advance, necessitating greater activities in order to meet the enormous demand of the home market. At this time, the Shibaura Works not only filled the requirements of the Japanese market but exported many of its machines and accessories to China and the other Asiatic countries. Unlike many of the Japanese "war babies" whose export trade fell off as soon as the armistice was signed, the business of the Shibaura Engineering Works, due to the high quality of its products, has retained much of its export business, carrying it through the deep depression which followed.



2,500 H.P., 163 R.P.M. Rolling Mill Motor made by the Shibaura Engineering Works

The perfection of its equipment and the excellent workmanship by export operatives supervised by the best experts of America, combined with strict code of business ethics has won for the company a reputation equal to the best of the American or European manufacturers. In the Orient they have no rival. The number of inventions on which the company holds patent rights covers more than 300, or far in excess of any other Japanese company. Its annual production is valued at Y.40,000,000 and during the war, this reached Y.50,000,000. It has paid steady dividends of twenty-five per cent. on its capital, of Y.20,000,000 of which only Y.8,750,000 is paid up. The company has a reserve of Y.4,062,720.



Cotton Mill Equipped with Shibaura Form K Induction Motors (double pulley four-frame drive) operating Spinning frames and twisters

In order to compete with the best foreign manufacturers and lower the cost of production, the company recently purchased more than 100 acres at Tsurumi, between Yokohama and Tokyo as a site for a complete new works. Here will be erected the most extensive plant of its kind in Asia, rivalling in equipment the best in Europe and America. The area of the present property at Shibaura is 24 acres, of which 14 are covered with buildings. The products of the company comprise: Direct and alternating current motors and generators, rotary converters, frequency changers, electric car motor equipment, transformers, induction regulators, switchboards, and protecting apparatus, electrice measuring instruments, electric fans and household appliances.

The Shibaura plant is equipped with two Lancashire boilers, 43 generators and 560 alternating current motors. The machine tool equipment includes 16 boring machines, 110 drilling machines, 95 grinding machines, 193 lathes, 9 air hammers, 6 rolling mills, 78 milling machines, 10 planing machines, 84 punching machines, 27 sewing machines, 18 screw machines, 12 shearing machines, 30 shapers, 14 slotting machines, 90 coiling machines, 38 fans and blowers, 51 hand cranes, 36 electric cranes, 133 special machines of all kinds, 42 moulding machines, 7 metal melting machines and 2 cupolas.

The officials of the company are: Mr. K. Iwahara, president, Dr. K. Kishi, managing director, Dr. Takuma Dan, Mr. M. Fujise, J. R. Geary, Dr. I. Notomi, O. Pruessman and B. Otake, directors, with Mr. I. Notomi, as engineer-in-chief, and Mr. Otake as business manager. The office force numbers over 1,078 and the factory workmen over 4,500.

No description of the Shibaura Engineering Works would be complete without some reference to the machinery department of the Mitsui Bussan Kaisha whose activities not only in Japan but in other parts of the world have contributed largely to the commercial success of this great experiment in international co-operation. The electrical business of the International General Electric Company in Japan has been for many years in the hands of this most efficient organization, and it is due entirely to its progressive members that Japan to-day is using more apparatus made by the General Electric Company than any other foreign manufacture. At the head of this organization is Mr. K. Nanjo, the managing director of the machinery department of the M. B. K., who has surrounded himself with a group of super-trained experts whose activities in all the branches of the company have resulted in its magnificent showing in sales.

Development of Japanese Electric Light and Power Business, 1912-1922

H. C. Hugins (Tr. and rewritten from an article in the Toyo Keizai Shimpo—"Oriental Economist," Sept. 23, 1922)

THE number of companies actually engaged in electric enterprises, light-power railways, in Japan increased from 327 in 1912 to 696 in 1922, about 112 per cent. The authorized capitalization of these companies increased in the same period from Y.373,500,000 to Y.1,765,000,000 about 372 per cent. Including government enterprises and private enterprises the available power generated increased from 462,000 kilowatts to 1,527,000 kilowatts, an increase of 231 per cent.

The outstanding feature of the development of the past ten years is the sudden rise of the water-power industry to a place of predominant importance. This rise is shown in the following tables :—

TABLE 1. NUMBER OF PLANTS

Year		Water Power: Open to business	Water Power: Not open to business	Steam Plants: Open to business	Steam Plants: Not open to business
1912	..	391	112	979	158
1913	..	510	102	1,099	96
1914	..	695	133	1,245	74
1915	..	943	112	1,297	56
1916	..	1,195	117	1,422	64
1917	..	1,331	137	1,560	75
1918	..	1,504	226	1,636	84
1919	..	1,755	303	1,708	114
1920	..	2,035	427	1,799	142
1921	..	2,434	411	1,890	118

TABLE 2. POWER CAPACITY OF PLANTS EXCLUSIVELY FOR POWER AND ELECTRIC RAILWAY SUPPLY.

Year		Total Capacity	Water power Generated	Percentage of Water Power
1912	..	355,000 kilowatts	199,000	56 per cent.
1913	..	459,000 ,,	286,000	62 ,,
1914	..	555,000 ,,	377,000	69 ,,
1915	..	574,000 ,,	395,000	69 ,,
1916	..	598,000 ,,	420,000	70 ,,
1917	..	653,000 ,,	454,000	70 ,,
1918	..	717,000 ,,	512,000	71 ,,
1919	..	789,000 ,,	576,000	72 ,,
1920	..	954,000 ,,	659,000	69 ,,
1921	..	1,088,000 ,,	759,000	69 ,,

TABLE 3. TOTAL POWER GENERATED IN JAPAN.

Year		Total	Water Power	Percentage of Water Power.
1912	..	462,000 kilo.	233,000 kilo.	50 per cent.
1913	..	597,000 ,,	322,000 ,,	54 ,,
1914	..	716,000 ,,	349,000 ,,	49 ,,
1915	..	772,000 ,,	341,000 ,,	44 ,,
1916	..	805,000 ,,	360,000 ,,	45 ,,
1917	..	876,000 ,,	457,000 ,,	52 ,,
1918	..	984,000 ,,	589,000 ,,	60 ,,
1919	..	1,133,000 ,,	800,000 ,,	70 ,,
1920	..	1,378,000 ,,	824,000 ,,	60 ,,
1921	..	1,527,000 ,,	915,000 ,,	60 ,,

If the reserves of steam plants were excluded from these tables the percentage of water power would rise to a very marked extent.

Comparing 1912 and 1921, water power plants increased 146 pre cent., while the number of plants utilizing steam power increased only 120 per cent. According to the latest figures the projected steam power plants will generate 175,000 kilowatts, while the projected water-power plants will produce a total of 1,068,000 kilowatts. The attention that Japanese industrial promoters are giving to water power is easily seen from these figures.

Not only have the electric power industries and their capacity increased during the past ten years, but the number of such enterprises with large capital has been steadily growing, and the outside limit of investment has risen also.

The following table shows the number of enterprises with capital of five and ten million yen organized during the period under review:—

Year		Enterprises capitalized at more than Y.5,000,000 Number	Enterprises with capital of more than Y.10,000,000 Number
1912	.. ..	8	8
1915	.. ..	14	14
1919	.. ..	16	22
1921	.. ..	18	44

There were only two enterprises with more than fifty million yen capital at the end of 1912, the Tokyo Electric Light Co., Ltd., and the Tokyo municipal electric bureau. To-day there are six companies having more than that amount of capital.

At the end of 1912 there were only eight companies which could supply between 5,000 and 10,000 kilowatts. At the end of 1921 this group of companies had increased to 51 in number, about 537.5 per cent advance. At the end of 1921 there were 46 companies generating more than 10,000 kilowatts, and this number was an increase of 411.1 per cent. since 1912.

There are many big power projects now under construction.

The Daido Electric Power Co., Ltd., expects to complete plants to generate 155,000 kilowatts from water power exclusively by the end of 1924. Mergers which this company plans to carry out, together with increases in equipment of the merged companies, will place more than 1,000,000 kilowatts in the control of this company alone by the end of 1931.

The Nihon Electric Power Company, a rival of the Daido, is hastening the construction of power plant construction so that it will have completed 130,000 kilowatts by the end of 1925. These two enterprises, together with the fact that there are now three companies in Japan capitalized at more than Y.100,000,000 show how Japan's electric industry has been expanding in recent years. The Tokyo Electric Light Company has only recently increased its capital to more than Y.220,000,000.

The following table shows the number of power plants, according to the amount of power produced:—

Power produced		1912	1921	Increase	Percentage of increase.
Under 50 kilowatts	..	800	2,783	1,983	247.9 per cent.
50-100 kilowatts	..	162	328	166	102.5 ,,
100-500 kilowatts	..	224	646	422	188.3 ,,
500-1,000 kilowatts	..	70	158	88	125.7 ,,
1,000-5,000 kilowatts	..	83	312	229	275.9 ,,
5,000-10,000 kilowatts		8	51	43	537.5 ,,
10,000 and more kilowatts		9	46	37	411.1 ,,
Total	.. ..	1,356	4,324	2,968	218.9 per cent.

(This table includes government and private plants)

As the business of the companies increased profits expanded. Income figures for 1921 are not yet available, but in 1920 the income of these companies from power supply alone was 15 times what it was at the end of 1912. Income from both light and power business, or power and electric railway business, etc., increased 10 times. The increase in the amount of power income shows the sudden increase of demand for power, during the war prosperity. The limited increase of income from combined business, especially income from light and railway enterprises, is largely due to the limitations of charges imposed upon these industries. The general tendency has been towards increasing prosperity, and the average profit, as a percentage of paid-up capital, increased from 8.3 per cent. in 1912, to 12.5 per cent. in 1920.

The following table compares details of income, expenditure and profit, in 1912 and 1920 :—

	1912	1921	Increase per cent.
No. of concerns	292	593	104
Income from lights	Y.25,600,000	Y.112,100,000	1,337
Income from power	5,700,000	92,400,000	1,521
Income from railways	21,600,000	89,000,000	322
Income from combined business ..	2,300,000	26,800,000	1,065
Miscellaneous income	3,100,000	31,200,000	906
Total	Y.58,400,000	Y.351,500,000	502
Expenditure ..	Y.36,400,000	Y.233,300,000	541
Profit	Y.22,000,000	Y.118,200,000	347
Profit percentage of paid-up capital	8.3 per cent.	12.5 per cent.	50

The figures given above show clearly the development of Japan's electric industry during the past ten years. They show that the use of kerosene and gas is on the decrease for lighting purposes; that power in engineering enterprises, industry and communications is gradually being changed from steam to electric. This state of affiars is going to continue for many years to come, and there is an enormous amount of hydro-electric power available which no efferts have yet been made to touch.

At the end of 1921 the department of communications estimated that there were 7,850,000 H.P. that could be obtained from Japan's rivers and streams. Of this something like 1,400,000 H.P. are now operating or under construction, and licenses have been granted for the exploitation of another 3 332,000 H.P., which will soon be under construction. The balance of 3,100,000 H.P. remains untouched.

(*Note.*—Table 1; these figures include power generated by private, government and electric railway companies. The figures are those of the department of communications.
Table 2; these figures include power "held in reserve," and power generated by government power houses for private use is included.

Japanese Rolling Stock

THE Imperial Government Railways of Japan now operate 3,516 locomotives, 24 electric locomotives; 8,425 passenger coaches and 52,027 freight cars. The budget allowance for the fiscal year 1922-1923 is Y.42,000,000, with which 255 locomotives, 10 electric locomotives (2 ordered from England, 2 from Switzerland, 4 America, and the other two to be manufactured in the railways' own shops at Omiya, outside Tokyo), 770 passenger coaches, including 120 electric cars, and 2,580 freight cars, will be built. Automatic train couplers and air control equipment will be installed in all the cars owned by the railways. Air control equipment is now used by the Sapporo bureau of the railway department, and by 1928 all the railway rolling stock in Japan will be equipped with this apparatus.

Gary Names New Secretary

ANNOUNCEMENT was made on July 19 that Frederick R. Sites has been appointed private secretary to Hon. Elbert H. Gary, chairman of the United States Steel Corporation. Mr. Sites has been connected with the corporation for about eleven years in the following positions: American Steel & Wire Co., Central Blast Furnaces, Cleveland, O.; Carnegie Steel Co., Homestead, Pa., metallurgical department; United States Steel Products Co. (nine years). He was recently assistant manager for China for the United States Steel Products Co. During a portion of the years 1918 and 1919, Mr. Sites was treasurer of the Federal Shipbuilding Company, but returned to China when the export business became active after the war. Mr. Sites graduated from the Massachusetts Institute of Technology in 1899.

Grain Handling Equipment in Japan

Changing conditions in Japan have developed a tendency on the part of flour millers there to locate new mills at points where grain and flour can be handled with greater facility, in order to reduce freight and handling charges, which have become of increased importance through the rapid rise in labor and other costs. Reports received indicate that in the future new milling plants in Japan will be located close to shipping facilities, as in the ports at Yokohama and Kobe, and wheat will be imported in bulk rather than in bags and unloaded from steamers into warehouse by means of pneumatic or other conveyors.

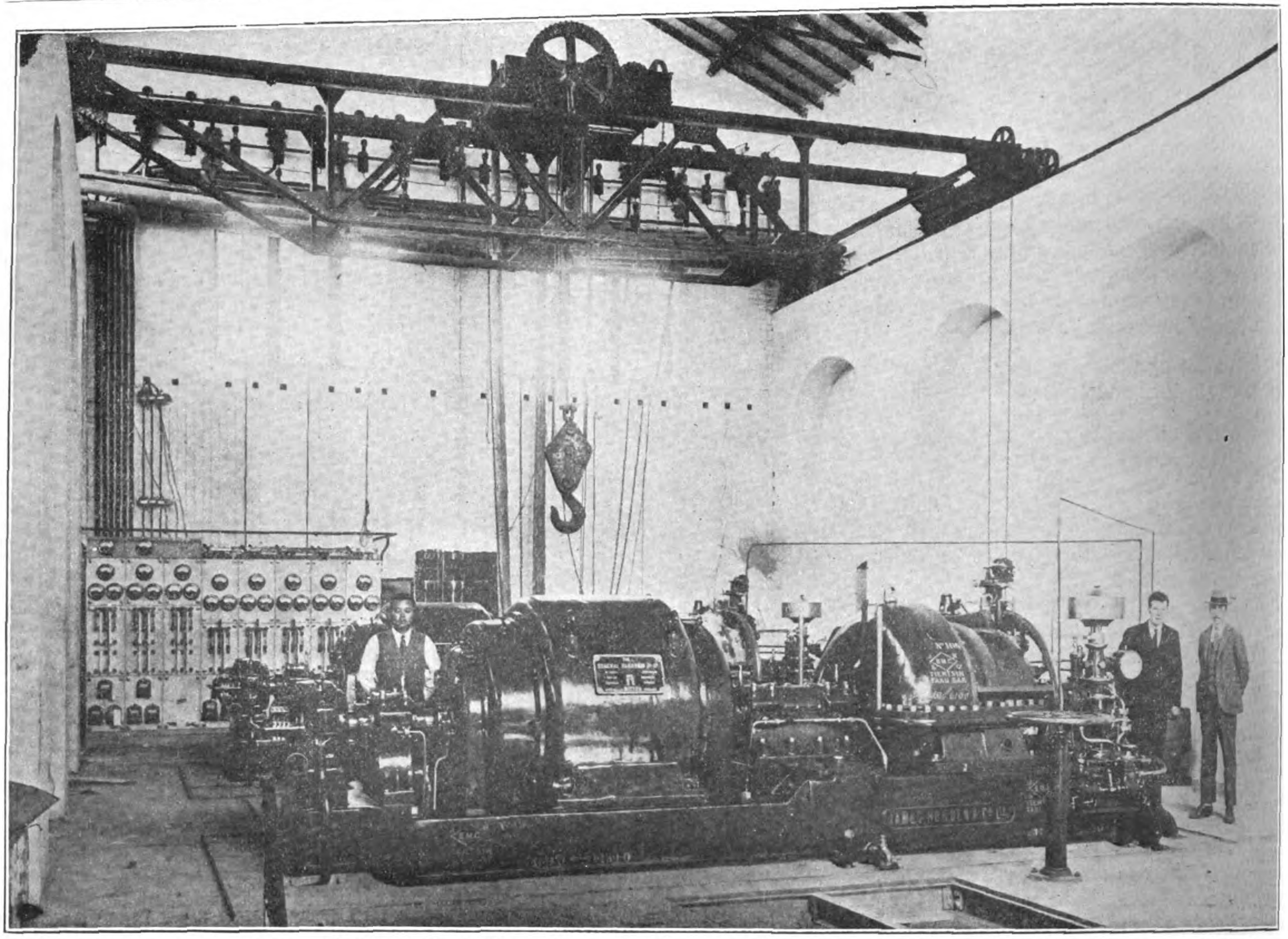
In view of the fact that there is a definite movement on the part of flour mill interests in Japan to adopt the above changes, it would appear that there is a definite market there for the conveying and other equipment needed when handling grain in this manner.

Buy American Railway Ties

The first sale of American railway ties ever made to the Imperial Japanese Railways was made recently. The order called for 260,000 Douglas fir ties, of which 60,000 were for jointments and 200,000 for straight rails. The average annual consumption of these railways is approximately 3,500,000 ties. According to Commercial Attaché James Abbott, Tokio, only companies which have been requested to do so may summit bids, and these companies seek to purchase in the market the kinds of ties specified in the tenders. A copy of specifications for railway ties for use on Japanese railways may be examined at the bureau of foreign and domestic commerce, Washington, or its district offices by referring to file No. 3702.

VOLTAGE OF TOKYO SUBURBAN RAILWAYS.—Because of the different voltages used on the three government electric railways operating around Tokyo city, it is impossible to use the cars of the Keihin line on the tracks of the others. The Yamate line which runs from Tokyo station to Shinjuku, Ikebukuro, and Nipporu, and the Chuo line from Manseibashi to Kichijoi through Yotsuya and Shinjuku, use 600 volts. The Keithin line, which was built later, uses 1,200 volt.

The motors of the cars on the Chou and Yamate lines will be rewound, and other necessary alterations carried out. To complete the work a large number of reserve cars is needed, and as the present number of carriages is not sufficient to handle the traffic, it has been impossible to make the necessary change before. But the railway department has recently ordered 36 new electric cars which will be completed this year for use on the newly electrified Tokyo-Numadzu section of the Tokaido line. These will not be needed until the end of 1923, or later, so they will be temporarily put into service on the round the city lines, while the voltage standardization changes are being effected.



Tientsin British Municipal Council's Electric Light Plant: Generating Room: 2-1000 K.W. sets of Howden Turbines Driving General Electric Co. Witton Generators: Alternating Current, 5,000 volts, 50 cycles, 3 phase, 3,000 r.p.m.

In the background is the low-tension switchboard for the station and local district. On the back wall are the cables for the high-tension feeders with lightning arrestors mounted above the windows. Above the machines is the 20-ton crane built in Tientsin

Tientsin's New Power Station

The British Municipal Council's Light Plant Ready

By O. D. Rasmussen

ELIMINATION of the personal element is a feature of the British municipal council's new electric power station constructed, under supervision of their electricity department, above flood level on the western bank of the Weitze creek in the British concession, Tientsin.

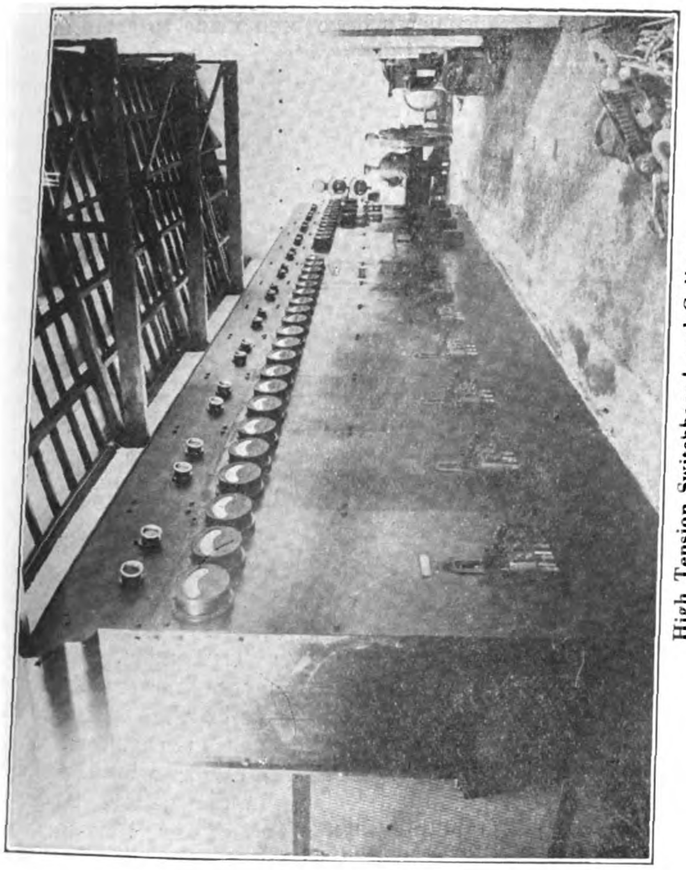
The present handsome structure of red brick and concrete, with its most up-to-date machinery, may be said to be the outcome of the amalgamation of the two former British administrations, so long the bone of contention among British residents of the port. When the British municipal concession joined hands with the British municipal extension and its additional extra-mural area, and threw their organizations and aspirations into common channels, the combined council seemed to take on a new lease of life. They decided to extend the sphere of municipal enterprise, refused to renew the expiring franchise of the old Tientsin Gas & Electric Light Company, and decided to build and conduct their own power plant.

The old franchise expired about eighteen months ago and pending the installation of the present plant the British concession has purchased its electric energy and light from the French Electric Light Company. This company supplies a 5,000 volt alternating current and the British municipal electricity department transformed it down at temporary sub-stations according to the required pressure.

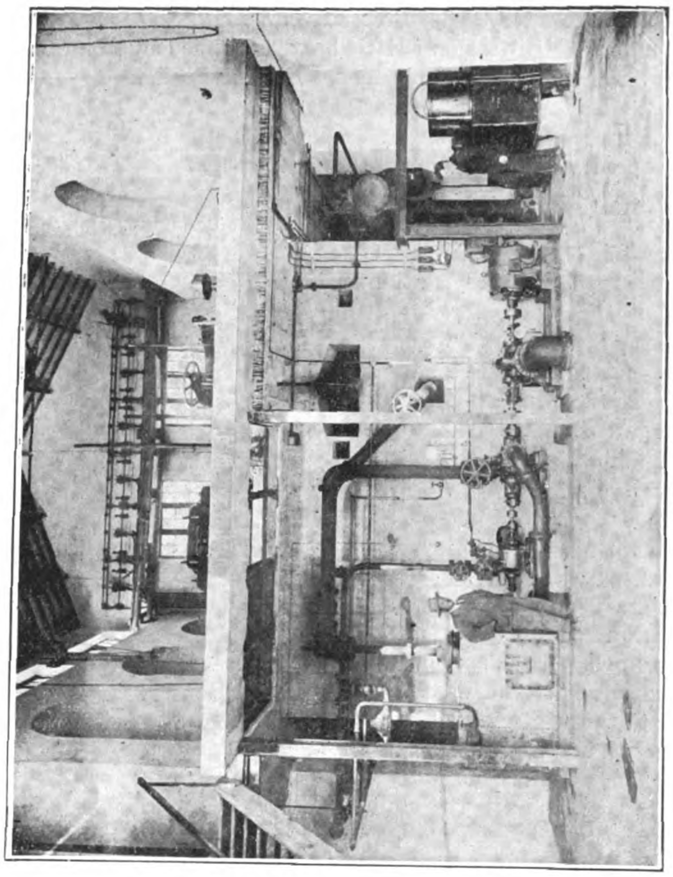
When the council decided to construct its own plant it was first planned to install two 500 kilowatts sets, alternating current, but it was soon found on investigation of the probable load that these would be insufficient. After thrashing it out in a public meeting, the council, acting upon the recommendation of its newly appointed electrical engineer, Mr. R. A. Williams, decided to install two 1,000 kilowatts sets, alternating current, 5,000 volt 50 cycles, 3 phase, to be transformed as required to 380 volt for power and 220 for light in the concessions. These sets have an overload capacity of 25 per cent.

The Witton generators are direct driven by Howden patent turbines, running at 3,000 r.p.m. at a steam pressure of 195 pounds, superheated to 586 degrees, Fahr. and supplied by James Howden & Co., Ltd, Glasgow. The dynamos or generators were supplied by the General Electric Company, Birmingham, England. A feature of the turbines is a forced oil circulation, under continuous filtration, by two oil pumps are supplied for each generating set, of

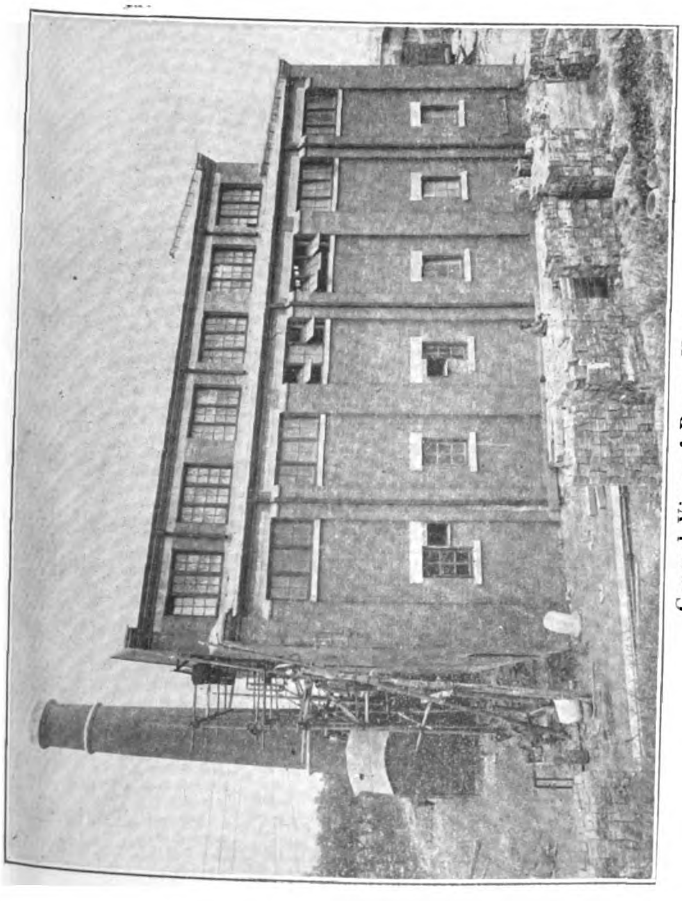
BRITISH MUNICIPAL COUNCIL'S ELECTRIC LIGHT PLANT AT TIENTSIN



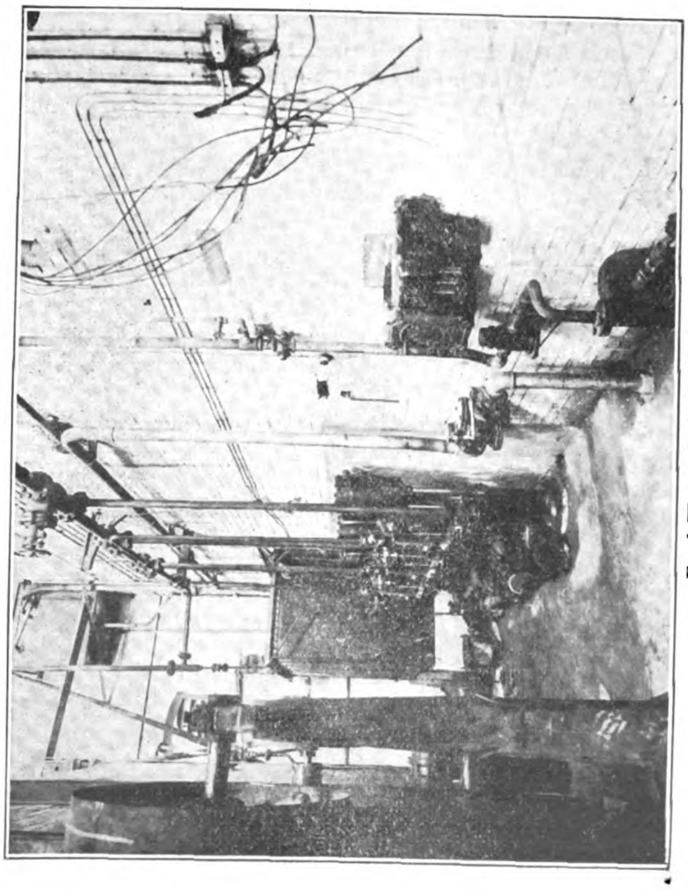
High Tension Switchboard and Gallery



Condensing Plant



General View of Power House



Feed Water Arrangements

which one is directly driven by the turbine shaft whilst the other, a steam reciprocating pump, is used for starting up the machine and as a reserve.

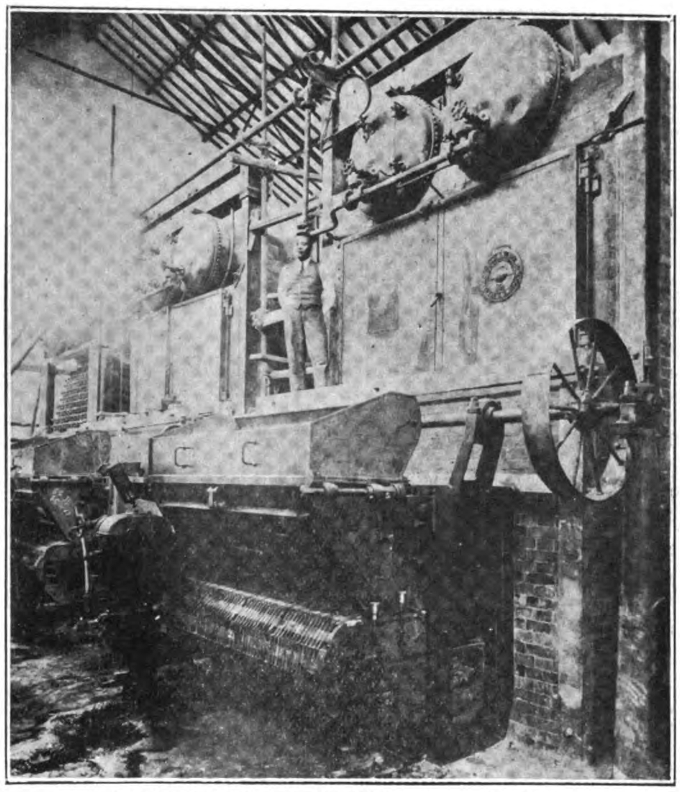
Dynamos are cooled by a forced air circulation, after passing through a special filtration to exclude dust. The condensing plant surface type was supplied by the Worthington and Simpson Company, London, and combines a circulating water pump, and air pump all of the rotary type, direct driven by electric motor.

The main high-tension switch board, supplied by Johnson & Phillips, London, is twelve panelled of the steel cellular type, and supplied with the various oil switches, etc., suitable for breaking loads of up to 40,000 kilowtts. This board is situated in a large room apart from but adjoining the dynamo room.

The low-tension switch board, designed and manufactured entirely by the B.M.C. electricity department, has eight panels and is of marble. It contains two sets of 'Busbars,' one for station or special use, the other for supplying neighboring districts with low-tension current. The remainder of the concession is supplied from the high-tension board and transformed down to the required pressure.

Under the switchboard room is the filtration chamber, where all air required for cooling the generators is freed from dust. The elimination of all dust from the generators is particularly important on account of the severe dust storms in the winter and the large amount of alkali contained in the dust. This room is also used as a meter testing laboratory to calibrate all meters used in connection with current supplied from this station.

The engine room is equipped with a well-designed 20-ton overhead crane constructed by the Eastern Engineering Works. This crane struck us as being a particularly well built piece of machinery and is a good example of what can be produced locally.



B. & W. Boilers with China Grate Stokers

The locally boiler house immediately adjoins the dynamo room, the steam pipes being of exceptionally short length to reduce the losses. The steam is generated in three Babcock and Wilcox boilers, each having a heating surface of 2,852 sq. ft., a superheater of 770 sq. ft. and a chain grate automatic stoker with a grate area of 65 sq. ft. Steam is supplied from these at a pressure of 195 pounds to the sq. inch. The automatic stoker is belt driven by an electric motor through reduction gear, thus eliminating the personal element as far as possible.

Feed water is supplied by three Weir's patent, vertical reciprocating pumps, which receive the water direct from a large steel hot-well, which is heated by exhaust steam from the force pumps. The water is obtained direct from the main water supply of the concessions, pumped into a small supply tank, under automatic control, thus again eliminating the personal factor. An artesian well is being sunk to a depth of 300 feet to serve as a possible source of clear feed water supply, more economical than that from the main supply. It will act a reserve supply in case of necessity.

The boilers were erected by Adair Graham & Company, now amalgamated with the Eastern Engineering Works, who are also sinking the artesian well. At present no economisers are is use, for when the station was designed the capital expense of economisers was found to be too great, comparatively, to show a saving in coal consumption. However, space has been provided for economisers, which can easily be installed without shutting down the station. For various reasons it was decided to use a comparatively short chimney stack, which is used in conjunction with a forced draft fan, belt driven by an electric motor.

The problem of dirty circulating water, which confronts all power stations in North China, owing to the great quantities of mud in suspension in all the principal waterways, has been attacked with what should be eminently successful methods. What appear to be elaborate arrangements have been made to guard against the difficulties arising out of dirty water. A tunnel has been built underground from the station out into the centre of the Weitze creek, well below water level. A 12-inch circulating water pump for each generating set draws through this tunnel creek water that must pass through a number of duplicate fine strainers, to exclude floatsam and suspended matter if these do not prove to be sufficient, moving or rotating strainers will be used.

The entire length of the Weitze creek is about to be deepened five feet, for concession drainage purposes, and at the station its course will be altered in such a manner that its centre will be moved fifteen feet farther away. The deeper water will tend to improve the quality of water at the intake.

The whole station was designed and its location fixed by the staff of the electricity department of the B.M.C., acting in conjunction with the council's engineer adviser in London, Mr. A. M. Sillar, a well-known authority and president of the British institute of consulting engineers. It was designed by men who have faith in the rapid and certain development of the use of this utility in Tientsin, and a corresponding faith in the future high status of this region as an industrial centre. Although not to be considered in any sense as yet an industrial community, the total load has risen in two or three years from 350 kilowatts to what is expected to be 1,000 kilowatts this year. The station is situated on the western bank of Weitze creek, at the west end of Bruce-road. The site is excellently chosen as the only place combining the facilities of large available quantities of circulating water and a convenient landing place for coal, which can be delivered by barges, fifty feet from the boiler house.

The illustrations which we reproduce show the station as it was being completed and before all the scaffolding had been taken down. The erection of the generating plant and switch gear has been entirely carried out by the electricity department staff and was completed in very quick time.

The engineer and manager of the department is Mr. R. A. Williams, M.C., B.S.C., A.M.I.E., E.A.M.I., MECH. E., who up to the outbreak of the war was consumer's engineer in the electricity department in Shanghai.

Japan Making Many Pencils

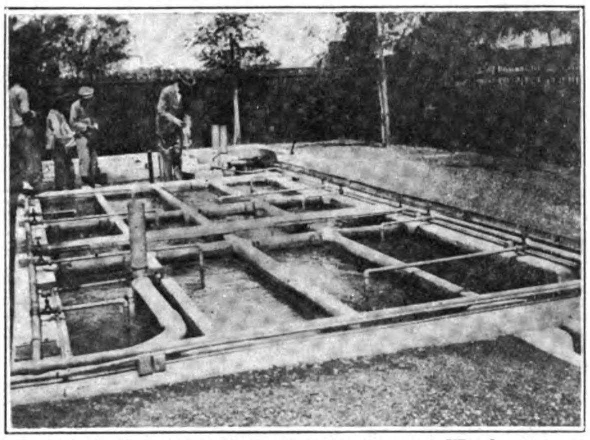
Japan has 117 pencil factories. No less than Y.6,900,000 (approximately $3,450,000. United States currency) is invested and 2,171 workmen are employed in this industry. In 1918 there were 1,292,082 gross exported. During the year 1916 to 1919 the total output of the empire was 9,868,000 gross. Tokio alone has eighty pencil factories, other important centres being Osaka, Hiroshima, Mie and Wakayama.

Up-to-date Sanitation for Shanghai

Three Activated Sludge Disposal Plants to Supersede the Offensive Pail System

AS the result of very careful investigations and studies on the part of its officials the municipal council of Shanghai has adopted the activated sludge process of sewage disposal as meeting the special requirements of the port better than any other system. During the past seven years this process has been developed from miniature laboratory models in the first stages of scientific observation to a practical and efficient working process capable of purifying sewage to a high degree. The development of this process has claimed the attention of sanitarians throughout the civilized world and promises to continue doing so in the future. The municipal authorities of many towns and cities in Europe and America have investigated and adopted the process as most applicable to conditions involved in their problems of sewage disposal, and it is gratifying to learn that the commissioner of public works of Shanghai was amongst the first to become interested in this new treatment as holding out a solution to the difficult problem that has confronted the model settlement in perfecting its sanitary arrangements.

The difficulties surrounding the construction of a proper sewage system in Shanghai has claimed the attention of its municipal engineers for many years, but for a long time no real advance was made owing to the controversies as to the best methods to adopt. However, it was emphasized that, first, that in no modern large city having an adequate water supply distribution, has a water-borne system failed to become necessary or advisable and second, the cesspoll system in congested areas could only be considered as a temporate measure, and the difficulty in disposing of the contents in a manner inexpensive as well as satisfactory in other ways would continue to increase. Financial considerations for a long time also entered largely into the problem, as the revenues derived from contracting the collection of the night soil and its removal outside the settlement where it was sold to the farmers for fertilizing purposes, was a considerable item in the municipal budget, as will be appreciated from the fact that the amount paid monthly by the contractors increased from $3,200 in 1899 to $16,200 in 1920, and $15,760 in 1921, a yearly addition to the municipal treasury of about $200,000. The loss of this revenue would have to be made up by taxation from other sources. As Shanghai derives its potable water from the Whangpoo river at a point near the down stream extremity of the settlement, the usual method of discharging sewage into its natural outlet had to be abandoned because of tidal river difficulties, while the low elevation of the mud flat upon which the city is built made an ordinary gravity system out of the question. As Mr. F. G. Helsby, of the public works department, pointed out in a paper on the subject, the two main difficulties in designing a suitable sewage system for Shanghai centred around the facts that no natural fall can be obtained by reason of the contours and that the depth to which sewers can be laid and pump chambers constructed is very much restricted on account of the water-logged nature of the soil. It was found that in trench excavation trouble is generally met with at a depth of more than 10 or 12 feet. Even if this could have been surmounted, the question of discharge into the river would have necessitated the construction of a pipe line to a point somewhere near the mouth of the river in order to avoid contamination of the water supply.



A Small Activated Sludge Treatment Works in the Western District of Shanghai taking care of the Sewage from a Group of Private Houses

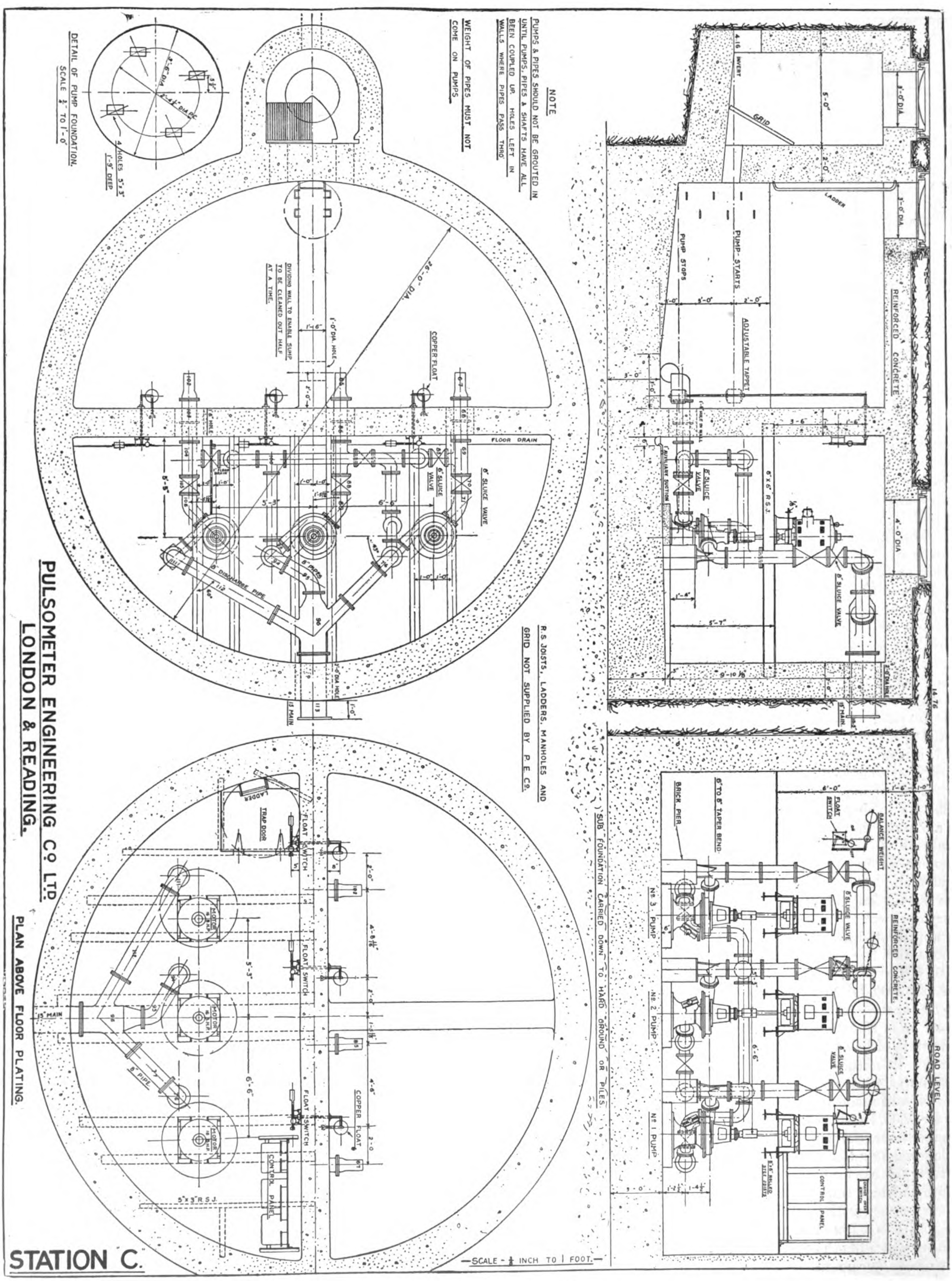
The activated sludge process came to the fore at a time when the problem of the disposal of Shanghai's sewage became most pressing and at once claimed the attention of the authorities as the most promising, efficient and economical method for application to the settlement. In designing the plans, arrangements were made solely for taking care of the actual discharge of closets, thus calling for a much smaller diameter of pipes and less work at the pumps and treating tanks. The storm waters in the settlement are taken care of by the regular drainage pipes discharging into the river, making two distinct systems of drainage in which the most offensive and inimical to the health of the community does not come into contact with the water supply at any point.

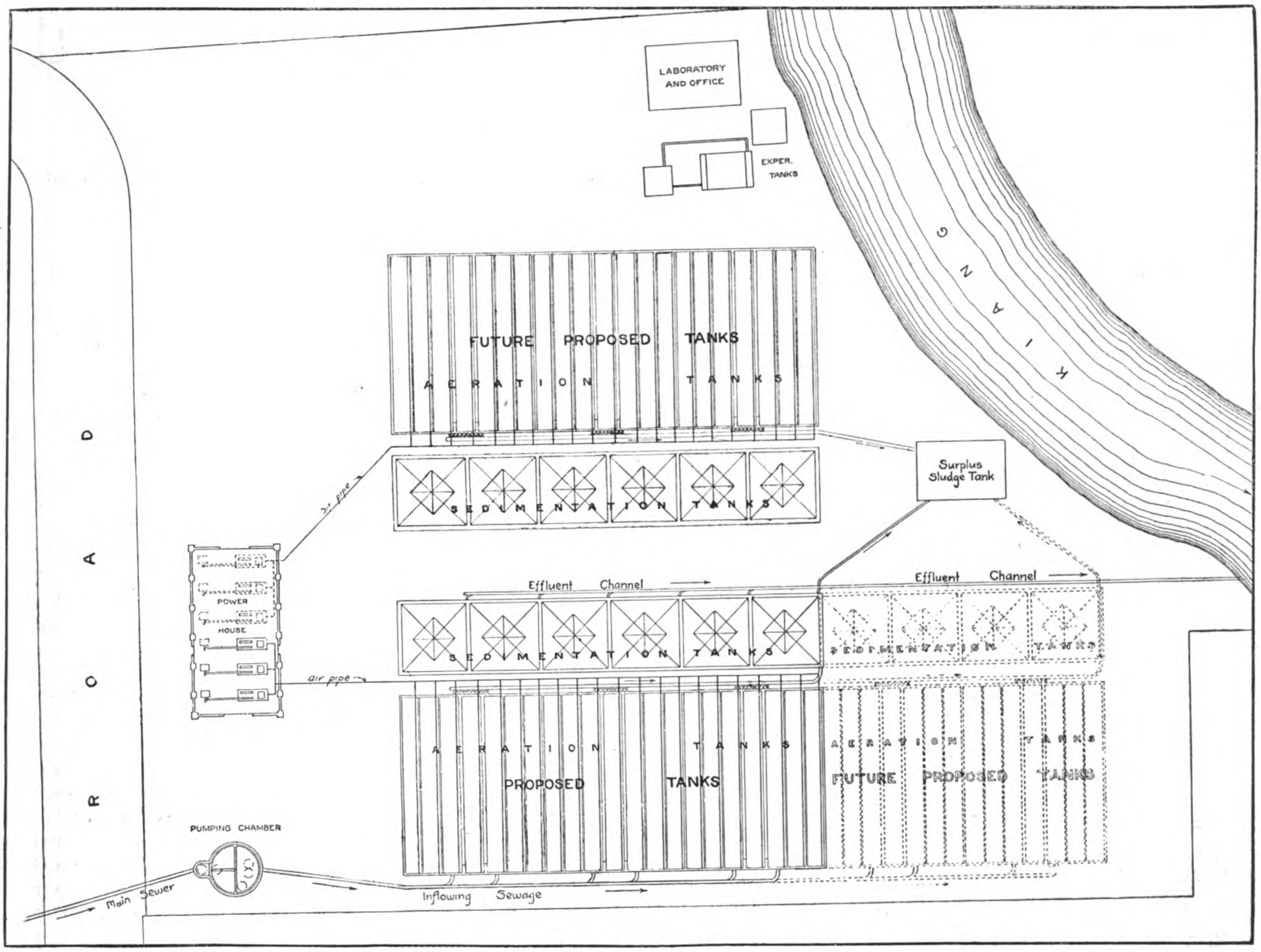
In designing the general plans to take care of the various districts of Shanghai, it was found more economical to divide the settlement into three separate districts with three separate treatment stations rather then one central plant. The scheme as finally adopted provides for the conveyance of sewage to three treatment works, one of these being situated on the land to the rear of the rifle butts, the effluent to discharge into the Sawginkiang, another being situated on land closely adjoining Brenan-road, the effluent to discharge into the Soochow creek, and the third to be situated towards the eastern end of the eastern district, the effluent to discharge into the Whangpoo close to the Point. The entire estimates of the cost of the scheme from 1921 to 1923 and subsequent program, amount to the comparatively modest sum of Tls. 3,870,000 including cost of land, or Tls. 3,750,000 exclusive of the land.

Although it would have proved more advantageous to have one central disposal plant, from the point of view of administration and initial cost, such a scheme would not prove economical on account of the vast amount of pumping that would be necessary. To pump sewage in any great quantities from the north to the south of the Soochow creek would be costly, and this would, of course, be necessary if it were decided to treat the whole of the sewage at one central site. The scheme is, therefore, based on lines of treatment at the three disposal sites referred to above.

Central District East of Honan Road

As the work on the central district serving the congested business area of the port is the most important and furthest advanced, it is possible to describe this at length. The same methods pertain to the other two districts. The sewers to be provided in the roads consist for the most part of 9 inches diameter concrete pipes. Surprise has been expressed at the small diameter of the pipes laid for the sewage system as compared with size of the surface and storm water sewage, but such views are due to incomplete knowledge of the position of such pipes in the general scheme, the volume of sewage to be provided for and the gradients and carrying capacities of the pipes. Criticism has also been made in respect to the use

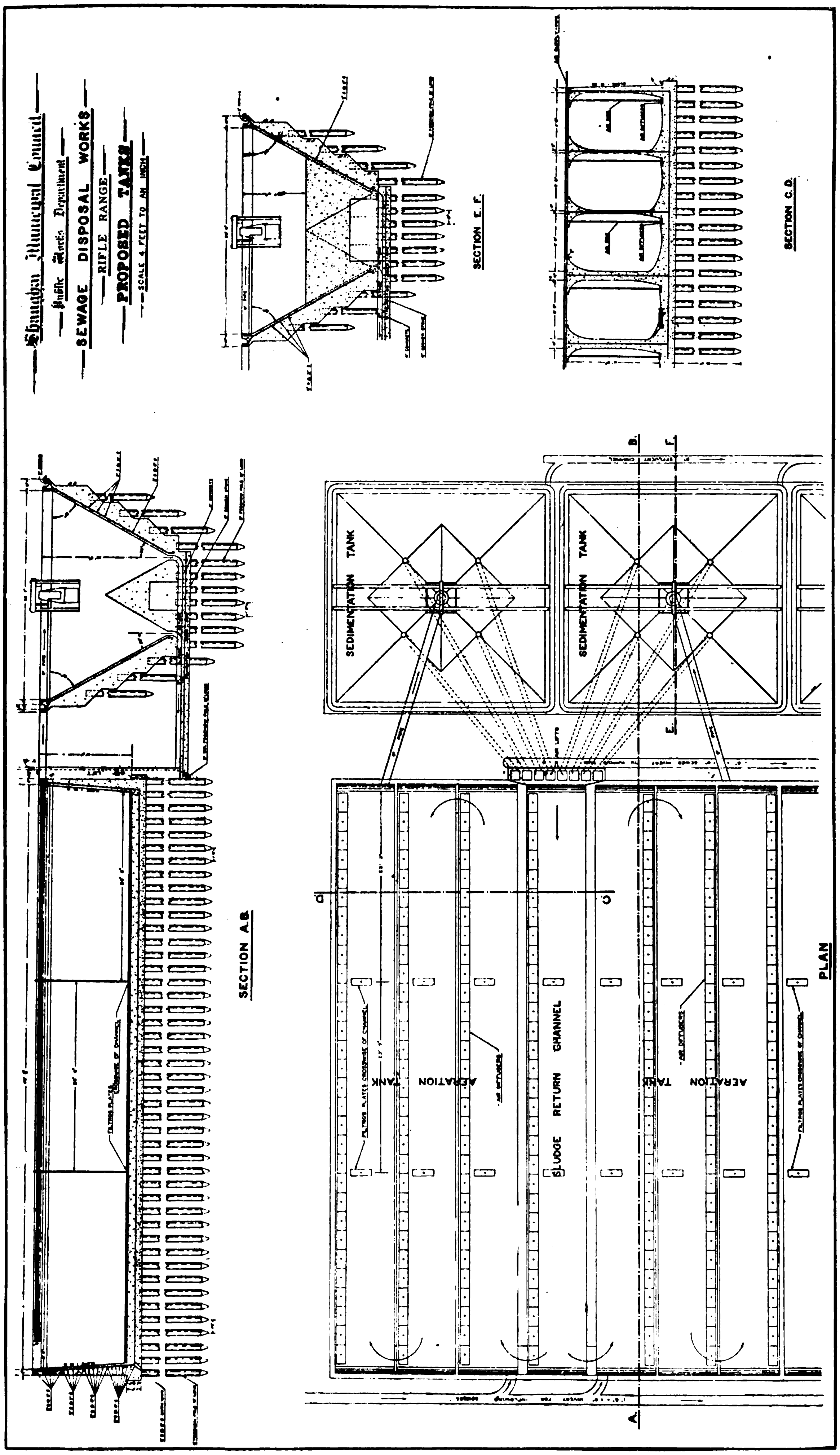

NOTE
PUMPS & PIPES SHOULD NOT BE GROUTED IN UNTIL PUMPS, PIPES & SHAFTS HAVE ALL BEEN COUPLED UP. HOLES LEFT IN WALLS WHERE PIPES PASS THRO.
WEIGHT OF PIPES MUST NOT COME ON PUMPS
DETAIL OF PUMP FOUNDATION. SCALE 3/4" TO 1'-0"
4 HOLES 5"×3" 1'-9" DEEP
DIVIDING WALL TO ENABLE SUMP TO BE CLEANED OUT HALF AT A TIME.
26'-0" DIA.
1'-0" DIA. HOLE
COPPER FLOAT
FLOOR DRAIN
8" SLUICE VALVE
8" DISCHARGE PIPE
R.S. JOISTS, LADDERS, MANHOLES AND GRID NOT SUPPLIED BY P. E. Co.
PULSOMETER ENGINEERING Co LTD. LONDON & READING.
PLAN ABOVE FLOOR PLATING.
LADDER
TRAP DOOR
FLOAT SWITCH
MOTOR
15" MAIN
8" PIPE
5"×3" R.S.J.
CONTROL PANEL
STATION C.
SCALE - 1/2 INCH TO 1 FOOT.
SUB FOUNDATION CARRIED DOWN TO HARD GROUND OR PILES.
GRID
LADDER
INVERT
PUMP STOPS
PUMP STARTS
ADJUSTABLE TAPPET
REINFORCED CONCRETE
AUXILIARY SUCTION
6"×6" R.S.J.
8" SLUICE VALVE
ROAD LEVEL
BRICK PIER
6" TO 8" TAPER BEND
BALANCE WEIGHT
FLOAT SWITCH
No 3 PUMP
No 2 PUMP
No 1 PUMP
CONTROL PANEL



of concrete pipes, owing to the failure of concrete pipes elsewhere. Notwithstanding that there have been cases of the failure of such pipes traceable to wrong design, improper material, bad workmanship, or a combination of all three, the fact remains that concrete sewer pipes have been giving excellent service since 1873 in many parts of the United States and since 1861 in European cities. Recent examinations of concrete pipe sewers, some laid in 1873 and others between 1874 and 1879, in different towns, have proved the pipes to be in first class condition. Investigations of concrete sewers in Vienna and Paris establish the fact that if the concrete is of the proper character, sufficiently dense and properly mixed, then sewage or sewage gases will have no effect on it. In view of the fact that the initial cost of the works could be greatly reduced by the construction of concrete sewer pipes locally, it was decided to adopt them. The nine inch size was determined upon as a minimum for the road sewers, notwithstanding that in certain localities a six or even a four-inch pipe would be theoretically sufficient for the conveyance of the sewage. Practical considerations relative to the choking and cleaning of such small pipes, however, influenced the selection of the nine inch as a minimum size. The main sewer in this district will run via the Bund, Whangpoo-road, Nanzing-road and Dixwell-road and terminate at the rifle butts treatment plant situated on the bank of the Sawginkiang.

The size of this sewer will increase from 12 inches in diameter at the Bund to 1 foot 6 inches by 1 foot, egg-shaped, after it leaves the central district. The pipes are laid so as to ensure a self-cleansing velocity to the sewage, this latter traveling by gravity from pump to pump *en route*, with the exception of the lengths crossing the Soochow creek, the Hongkew creek and the Sawginkiang. Pumping mains are provided over these crossings, one length of 1,250 feet and one of 3,115 feet being necessary to overcome these obstacles.

Underground pumping stations are provided at six localities along the main sewage line from the central district to the rifle butts. These stations, shown in the plans attached, are equipped with the R. C. Parsons patent type of "Stereophagus" vertical spindle self-clearing centrifugal pumps made by the Pulsometer Manufacturing Company of England. They operate at a speed of 700 rpm. and driven by protected type induction motors of 350 volts, 50 cycles and 3-phase supply. These motors are provided with automatic contact starting panels connected to float switches operated by float gears consisting of a positive system of rods and levers. Each pump is driven by a separate motor and any pump in a chamber can be operated independently or all in unison. The motors are provided in addition with a dual supply of current. The underground stations are to be equipped with two pumps, and in the case of some of the more important ones, with three, in which one pump in a chamber is a "stand-by" for use in an emergency or breakdown of the others. The plan shown in connection with this article shows a station equipped with three pumps. Station "A" is to have two 4 inch, "B," 2—6-in., "C," 3—6-in., "D," 3—6-in., "E," 3—6-in. and "F," 3—6-in. pumps. The special feature of these pumps is that they do not become choked by the passage of ordinary solids. The impeller, which is conical, has a number of spiral blades, which, working against a straight cutting blade,

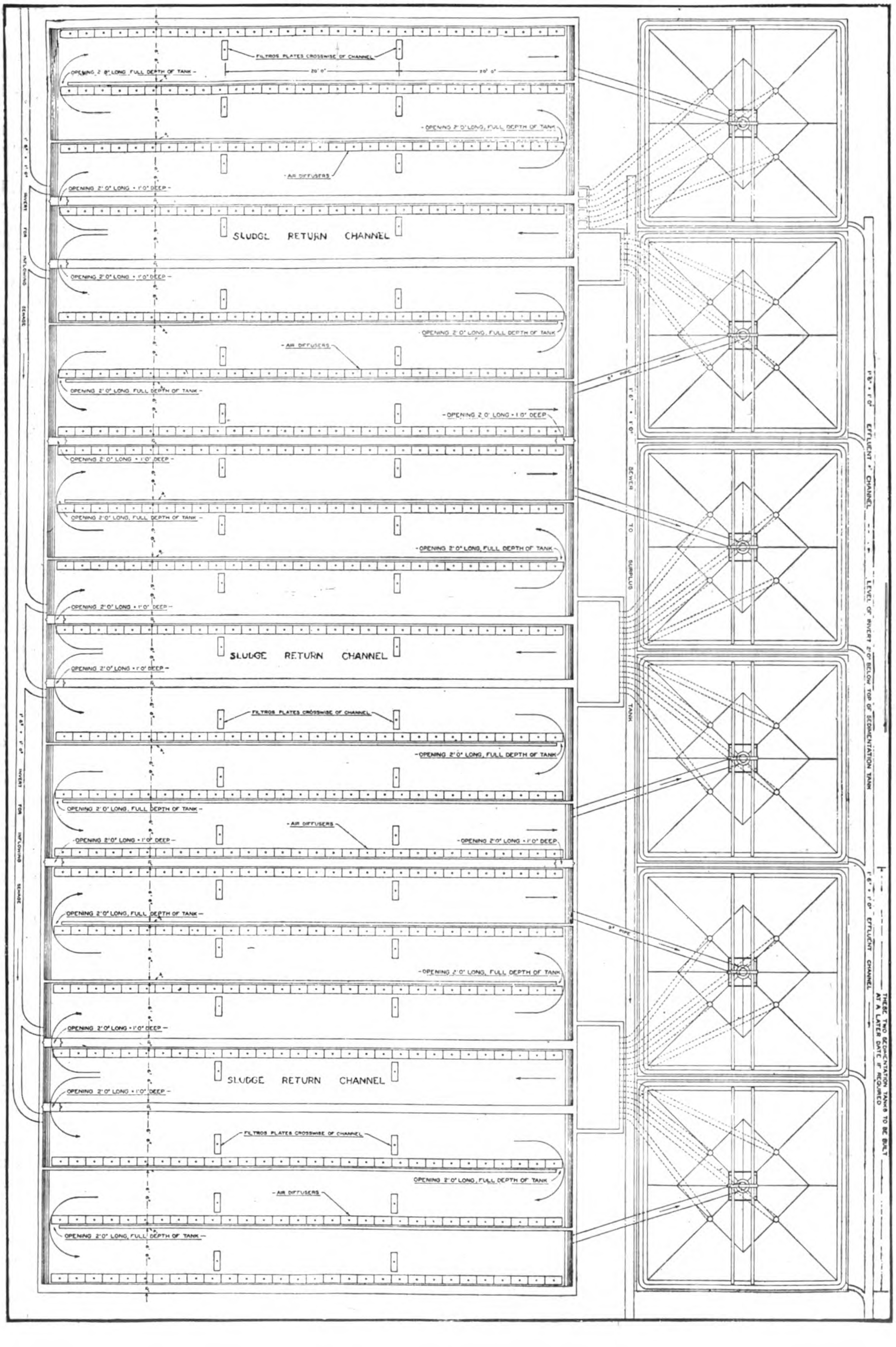


provides an action which is likened to that of a mowing machine, which effectively breaks and disintegrates any solid matter passing through the protecting screen in the outer chamber.

These underground pump chambers, as will be seen from the plans attached, are circular in form, 26-ft. diameter, sunk 17-ft. 6-in. below the level of the street with a 12-ft. depth inside. The walls are 2-ft. thick. The well is divided by a concrete partition into two chambers one for the pumps and motors and the other as a suction and float chamber. There is also a smaller 5-ft. diameter receiving chamber on the outside into which flows the sewage from the mains and in which is located a grid or bar screen to prevent heavy solids passing into the suction chamber. This chamber has a separate manhole for facility in cleaning. By means of a float connected to a rod operating directing on the motor switches the pumps are automatically set in motion when a certain level is reached in the suction chamber, and are brought automatically to a stop when the chamber is nearly empty. The suction chamber is divided by a wall to enable the pump to be cleaned out half at a time without interfering with the regular operation of the system. The pump chamber is also divided into two sections by a floor plating upon which are installed the electric motors and the control panels. In the lower section are the pumps.

Central District West of Honan Road

This provides for the area west of Honan-road in which the main sewage will flow by gravity after it leaves the central district through the mains on Bubbling Well-road. The only pumps necessary to deal with this area will be three six inches at the junction of Bubbling Well and Thibet-roads. The sewage will gravitate to this point by two main sewers one of 12-inches diameter traversing Hankow-road and Tibet-road picking up the


FILTROS PLATES CROSSWISE OF CHANNEL
20' 0"
OPENING 2' 0" LONG, FULL DEPTH OF TANK
AIR DIFFUSERS
OPENING 2' 0" LONG × 1' 0" DEEP
SLUDGE RETURN CHANNEL
1' 8" × 1' 0" INVERT FOR INFLOWING SEWAGE
8" PIPE
1' 6" × 1' 0" SEWER TO SURPLUS TANK
1' 8" × 1' 0" EFFLUENT CHANNEL
LEVEL OF INVERT 2' 0" BELOW TOP OF SEDIMENTATION TANK
THESE TWO SEDIMENTATION TANKS TO BE BUILT AT A LATER DATE IF REQUIRED

sewers in the area south of Nanking-road, and another 12-inch main viâ Ningpo and Lloyd-roads. The subsidiary sewers draining into these mains will all be of 9 inches as in the northern district.

Western District

The main sewers for the service of this district will connect with the mains of the central district at the Thibet-road station and will travel westward along Bubbling Well, Hart, Yuyuen and Brenan-roads to the treatment works, subsidiary mains entering at the junction of Mohawk, Burkill and Gordon-roads with Bubbling Well-road. The main sewer from Tibet to Mohawk-road will be 1-ft. 6-in. by 1-ft. egg-shaped, Mohawk to Gordon-road, 2-ft. 3-in. by 1-ft. 6-in. egg-shaped, and from Gordon-road westward 3-ft. by 2-ft. egg-shaped. The pumps required on this line will be three nine-inch pumps at the junction of Gordon-road, three 10-in. in Yuyuen-road west of Tifeng, three 10-in. in Brenan-road east of the railway crossing, three 10-in. in Brenan-road east of the Fahwah creek, and three 10-in. at the treatment site, one pump in each case to be in reserve.

To pump the sewage from the area bounded by Thibet-road, Chengtu-road and Avenue Edward VII, it will eventually be necessary to install two 4-in. pumps at the junction of Weihaiwei and Mohowk-roads, the sewage being conveyed through a 12-in. pipe to join the mains on Bubbling Well-road. The sewage from the area bounded by Myburgh, West Soochow and Carter-roads, north of Bubbling Well-road, would be raised by means of two 4-in. pumps at the junction of Avenue and Chengtu-roads being conveyed by a 12-in. main to join the main sewer.

The sewage from the northern portion of the western district would involve the installation of two 6-in. pumps at the junction of Gordon and Robison-roads and two six-inch pumps at the junction with Connaught-road, the sewage being conveyed from the former station to the latter by means of a 12-in. pipe and from the latter to the main with its pump station on Bubbling Well-road.

Eastern District

The main line of sewer for this district will traverse Pingliang Dalny, Wayside, Paoting, Kwenming, Chusan, East Yuhang, East Hanbury and Yuenfang-roads, four pumping stations being provided *en route*. The site of the treatment works is near the eastern extremity of the settlement and the effluent will be discharged into the river near the Point.

Rifle Butts Treatment Works

The principle applied in the three treatment works of which the one at the rifle butts is typical and nearly completed, is the one of promoting agitation of the sewage by compressed air pipes leading into the vats, ensuring a constant supply of oxygen and bringing the bacteria in the sewage into continuous proximity to the activated sludge produced. With this system it has been proven that it is possible to produce an effluent of practically any degree of purification, the discharge liquid being almost as clear as the water from the taps. By the diffusion of air forced by compression through specially constructed plates the air bubbles rising from the bottom of the tanks and traveling upward through the mass of contained sewage keep the latter in a constant state of agitation and oxygenation. The amount of air required varies with the quality of the sewage under treatment and may range from three-quarters to 1½ cubic feet of free air per gallon. The area of the diffusion plates is about one-sixth of the tank area and the time occupied by the sewage in the tank is about six hours.

In the rifle butts works, there are now under construction four reinforced concrete sedimentation tanks of 20,000 gallons capacity each and six aeration tanks of reinforced concrete of 80,000 capacity gallons each. This plant is operated on the continuous flow system in which the air diffusion is obtained as above described by flowing air through " filtros " plates, a special form of air diffusion in which the plates are in cast iron cases resting on the bottom of the aeration tanks and so arranged that any one may be removed for inspection or renewal when necessary without interfering with the operation of the others.

The compressed air for the agitation of the sewage is generated at a power house nearby (60-ft. by 308) in which is installed three Ingersoll Rand Class " ERE-1" straight line belt-driven compressors driven by 22 h.p. electric motors with current supplied from the municipal electricity plant. The air cylinders of the compressors are 14-in. diameter by 10-in. stroke, having a capacity of 441 cubic feet of free air per minute, under a pressure of 10-lbs. per square inch, speed 250 rpm. and 22 h.p. Room is provided in the power house for doubling the compressor capacity as conditions warrant.

There are three air containers, one for each compressor, 3-ft. 6-in. diameter by 8-ft. high, with 5-in. outlet pipes leading into 8½-in. cast mains tapering down to 6-in. at the end of the line. For the service of each aeration tank a 2½-in. galvanized iron pipe branches off from the main leading across the top of the tank, to which in turn are connected 27 regulating valves with ¾-in. down pipes fitted to their respective cast iron filtros on the bottom of each tank. The current of air arising from the side at the bottom gives the sewage a circular motion and in addition there are two filtros plates set crosswise in the tanks spaced twenty feet apart which acts as baffles and tend to retard the flow and prevents short circuiting.

The aeration tanks, of which there will be six with three sludge return chambers in the original installation at the rifle butts works, are rectangular in form, each with three channels, 52-ft. by 6-ft. 6-in. with a depth of 11-ft. The sewage enters the first series of tanks and is subjected to the continuous aeration process over a total distance of 180-ft., during which time it is kept constantly agitated and brought into contact with the sludge, the partially clarified liquid passing off at the top to the sedimentation or setting tanks.

Six of these tanks are provided for in the original installation at the rifle butts works. They are also constructed of reinforced concrete (22-ft. by 22-ft.) at the top. Ordinarily these should have tapered down to one outlet at the bottom, but owing to the nature of the soil, could not be carried down to more than 14-ft. on a pile foundation, and to obtain the necessary outlets it became necessary to modify the construction of the tanks so that there would be four outlets instead of one. The partially clarified sewage passes from the first series of aeration tanks by a 9-in. pipe to the sedimentation tanks, where it is allowed to settle, the clear effluent draining off at the top and discharging through an open channel into the nearby creek. The thick sediment or sludge so essential to the bacteriological part of the process is drawn off through the four 9-in. outlets at the bottom of the tanks into an air chamber where it is forced up by compressed air and delivered back to the sludge return tanks forming part of the aeration tank system, thus providing a continuous process. When the thick sludge accumulates to an extent beyond the requirements of the process it is drawn off and sundried on a sand bed, or it can be sold to the farmers in a semi-solid state as fertilizer. The residual sludge when thus dried resembles baked mud. Its high nitrogen content makes it of great value as a fertilizer.

Provision has been made in designing the rifle butts disposal plant for all necessary extensions as the demand upon the works increases by a larger flow of sewage. The plant also has a bacteriological laboratory attached where constant inspection of the sludge is carried on.

Prior to finally recommending the adoption of the activated sludge system by the Municipal Council, careful investigations were made as to the results of this system in England and the United States and the satisfactory results obtained justified its use locally. The chemical and bacteriological side of the problem is under the control of a chief sanitation chemist, an official recently retained by the council, while the civil engineering work connected with laying the sewers, installing the pumping plants and constructing the treatment works and the manufacture of the concrete pipes, are under the supervision of the public works department.

When the system is completed Shanghai will have a plant ranking with the best of its kind in the world and the only one in Asia this side of India. Other large cities in America and England are adopting a system which does away with all nuisances hitherto connected with sewage disposal. The latest American city to adopt the system is Chicago which is about to embark upon a scheme for treating 263 million gallons per day, while the largest plant actually in operation is at Houston, Texas and the largest works under construction at the present time are those at Milwaukee. Shanghai has kept abreast of the times. G. B. R.

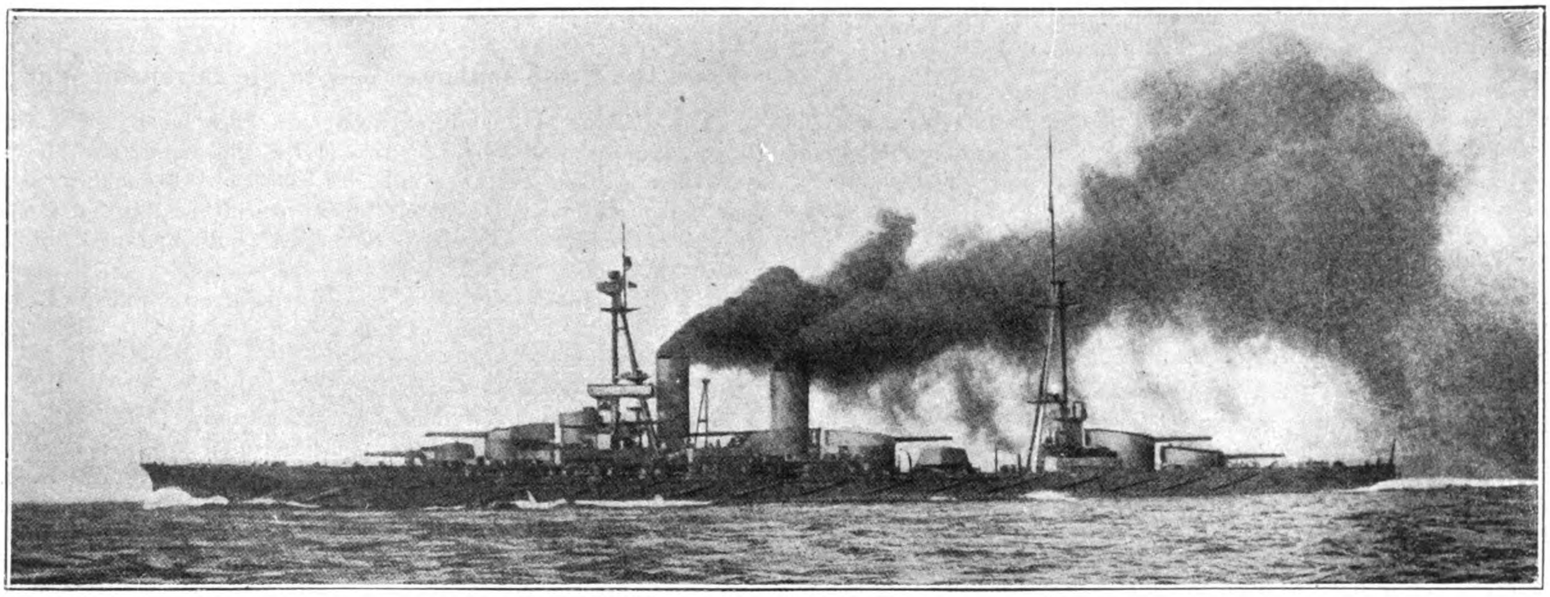
Shipbuilding Industry of Japan; Its History and Future

(Translated and rewritten from an article in the "Oriental Economist," September 23, 1922)

By H. C. HUGGINS

WHEN Admiral Perry sailed into the bay of Tokyo in 1853, the Tokugawa Shogunate was thrown into a panic, and as a result of the visit of the American fleet the two and a half century old prohibition on the construction of vessels large enough to sail the outside seas was withdrawn. The Shogunate government itself, at once began the construction of a foreign-style ship at Uraga, a vessel 132 feet long and 30 feet wide.

Encouragement was given to the diamyo to build large type vessels. As a result of the government's attitude by the time of the restoration of the emperor to his old unlimited power in 1868, there were seven shipbuilding yards in operation at Nagasaki, Yokosuka, Yokohama, Uraga, Ishikawajima (in Tokyo, on the Sumida River), Hyogo (Kobe), and Kagoshima.



H. I. J. M. S. "Hyuga." Gross Tonnage, 30,800, Built for the Imperial Japanese Navy at the Nagasaki Works of the Mitsubishi Shipbuilding Co., Ltd.

The yards at Nagasaki, Yokosuka, Yokohama, and Uraga belonged to the Shogunate; the Ishikawajima yard was owned by the Mito Diamiate, the Hyogo yard by the Diamiate of Kanazawa and the Kagoshima yard by the lord of Satsuma. But these three feudal properties came into the hands of the imperial government in 1870. In that year the imperial government, in order to stimulate deep-sea shipping, promulgated a commercial ship law, by which assistance was offered to Japanese who would acquire ownership of foreign type vessels. In 1875 to further its desire that foreign type ships be adopted far and wide, the government prohibited construction of Japanese ships of more than 500 *koku* (50 tons). In spite of the government's acts the building of foreign type ships in Japan did not prosper in private hands, so that most of the shipbuilding was undertaken by the government.

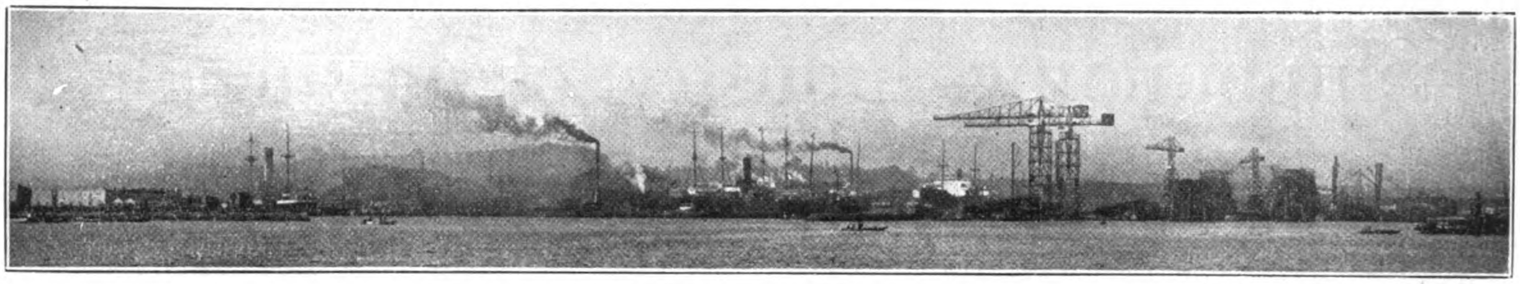
The following table shows the number of foreign type vessels owned by Japanese, registered in Japan from the fifth year of the restoration, 1873 to 1880:—

Year	Steamers. Number	Steamers. Tonnage Tons	Sailing Vessels. Number	Sailing Vessels. Tonnage Tons
1873 ..	2	32	2	91
1875 ..	14	462	—	—
1878 ..	25	912	51	5,204
1879 ..	19	839	50	5,781
1880 ..	40	3,186	146	10,889

The wars with Satsuma and Formosa in the last five years of the seventies made great demands upon Japanese shipping, and private shipbuilding yards began to spring up to satisfy the demand for vessels. In 1881 the Osaka Tekkojo (Osaka Iron Works) was established, and the Ono Shipbuilding Yard was opened to business in 1884. The government took advantage of the tendency of private capital to interest itself in this new industry, and the Nagasaki Shipbuilding Yard which in 1874 had been leased to the Mitsubishi interests, was sold to them in 1884, while the Kobe Shipbuilding Yard, leased to the Kawasaki interests in 1876, was sold to them in 1884. About the same time the Ishikawajima and Uraga Shipbuilding Yards were transferred to private management.

During this period, 1874-1885, the type of vessel constructed changed from wood to iron, but the number of iron vessels did not exceed 30 in all at any one time. The largest iron ship was under 500 tons, when the change to steel-built vessels was made.

In 1890 the Osaka Shosen Kaisha placed an order with the Mitsubishi Shipbuilding Yard in Nagasaki for two steel vessels of 610 tons each, and another order with the Kawasaki Shipbuilding Yard at Kobe, for two vessels of 576 tons each. These orders stimulated the development of steel shipbuilding in Japan. But with all the development of the industry Japanese shipbuilding yards were not able to construct vessels larger than these. The Nippon Yusen



A Great Japanese Shipyard. View of Yokohama Dock Company's Works at Yokohama

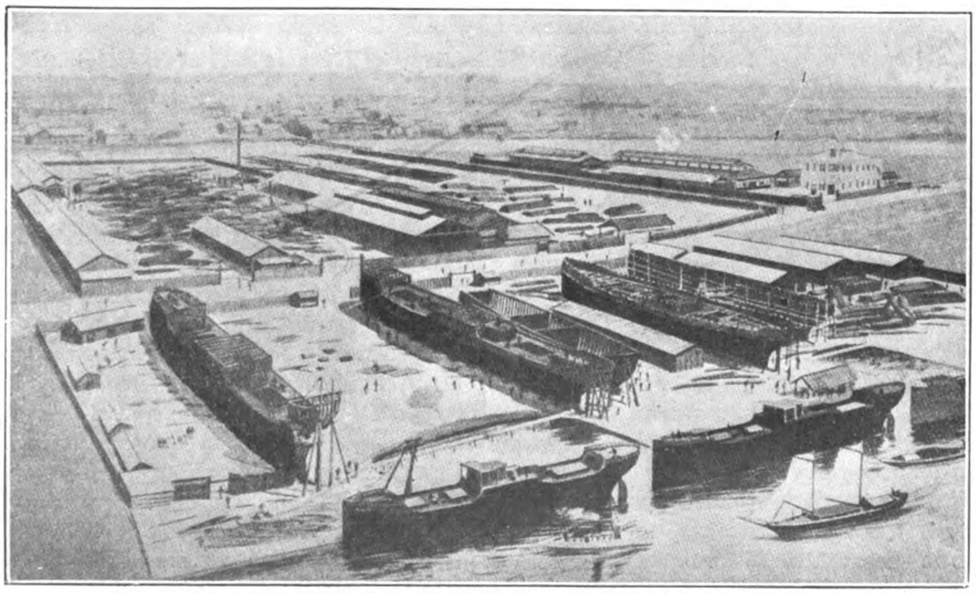
Kaisha was accordingly obliged to order its large iron and steel vessels abroad. As a matter of fact, before 1890 the shipbuilding industry had not yet caught up in development with the shipping interests.

From Sino-Japanese War to Russo-Japanese War

The shortage of large type vessels during the Sino-Japanese war was a great handicap to the Japanese people. The Japanese dockyards were unable to supply the size of vessel needed, and could conduct the repairs necessary to the existing fleets. However, during the war period the Mitsubishi Dockyard at Nagasaki built the *Suma Maru*, 1,160 tons, which was the marvel of the Japanese shipbuilding world at that time. It was the first vessel ever built in Japan of more than 1,000 tons burden and with a double bottom. Encouraged by the success of its experiment with the *Suma Maru*, the Mitsubishi Dockyard launched the *Miyajima Maru*, 1,592 tons, in 1897, and the *Tategami Maru*, 2,691 tons in 1898.

One of the results of the Sino-Japanese war was to stimulate the demand for better equipped shipbuilding and dockyards. In October, 1896, an act to encourage shipbuilding was promulgated, providing for a subsidy of Y.11 to Y.22 a ton on all steel steam vessels over 1,000 tons built in Japan. One of the immediate results of this act was the establishment of the Hakodate Dockyard Company. The Ishikawajima Dockyard Co. built a branch yard at Uraga, and a new company, the Toba Shipbuilding Co., was organized and opened a new yard. But the number of vessels constructed under this law was very small. The principal steamers whose makers were subsidized under this law were the *Tsukishima Maru* (tonnage unknown to-day), *Hitachi Maru*, 6,172 tons, *Taigen Maru*, 1,694 tons, and the *Awa Maru*, 6,133 tons. Even under the protection of this law the shipbuilders all showed losses on their construction accounts.

During this period the number of high-speed high-class vessels registered in Japan was entirely imported. The government accordingly amended the act of 1896, and in 1899 the subsidy granted shipping companies for maintaining overseas and interport trade was halved for those vessels purchased abroad. This act stimulated Japan's shipbuilding industry, and the number of vessels constructed at home began to increase. The table on the next column shows this effect.



One of the Smaller Japanese Shipbuilding Yards: The Works of the Osaka Shipyard Co., Ltd. at Osaka

Vessels Built in Japan before the Russo-Japanese War

Year	Number	Tonnage
1899	52	15,421 tons
1903	128	37,314 ,,
Increase in 4 years	75	21,893 ,,

The government's interest in the development of shipbuilding stimulated the private owners to improve the equipment of their yards, and the efficiency of their workmanship was much enhanced in the years between the Sino-Japanese and the Russo-Japanese wars. As a result the Kawasaki Shipbuilding Yard in 1902 received an order from the Chinese government for one vessel, the first foreign order for a Japanese-build ship. In 1903 the same yard built the *Taisei Maru*, 2,287 tons, a vessel which was said to be one of the finest of its kind ever constructed in the world, considering the perfection of its equipment. This vessel has been used as a practice ship of the Tokyo marine school.

From the Russo-Japanese War to the European War

The existing shipbuilding yards were kept busy during the Russo-Japanese war repairing vessels for the army and navy departments. But at the same time they were launching new vessels just as fast as their equipment permitted. In 1904 the government accepted for subsidy nine vessels built in Japan, with a total tonnage of 15,000 tons. In 1905 the tonnage of such vessels amounted to 13,000 tons. During the Russo-Japanese war the Kobe yard of the Mitsubishi Shipbuilding Co., was opened to business.

The principal feature of the shipbuilding industry during this period was the beginning of construction of destroyers in Japan.

Japanese shipbuilders had been constructing torpedoes for the navy, but until the period between the Russo-Japanese and the great war none of them had ever attempted to build destroyers. The Mitsubishi, Kawasaka and Uraga Shipbuilding Yards, and the Osaka Tekko-jo all built destroyers during this period. Eventually as their experience gave them more confidence some of these companies extended their work for the navy department to the construction of cruisers and even battleships.

With all the development up to this time, the *Tanba Maru*, 7,460 tons, was the largest ship launched and completed by a Japanese shipbuilder. But after 1907 the attention of shipbuilders was turned to the construction of vessels

of larger type, and the *Tenyo Maru*, and the *Chiyo Maru*, tonnage 13,500, with a speed of twenty knots were launched in 1907 by the Mitsubishi Dockyard. These two steamers were the largest ever launched on the Pacific Ocean, and the perfection of their construction, and the novelty of their equipment, placed them in the front rank of the world's finest passenger steamers.

During the Great War

The European war brought a prosperity to the Japanese shipbuilding yards never experienced before. The capacity of the yards increased by leaps and bounds, as can readily be seen in the following table:—

Development of Shipbuilding during the Great War

	December 1913	June 1918
Number of shipbuilders	5	53
Authorized capital	Y.25,550,000	Y.163,050,000
Paid-up capital	Y.23,150,000	Y.109,554,000
Debentures issued	Y. 3,600,000	Y. 22,050,000
Number of yards	6	57
Number of slips	17	157
Number of workmen employed	26,139	95,197

(Only yards with capacity for vessels of 1,000 tons or more are included in this list. Also slips.)

Compared with December, 1913, the number of yards in operation the end of June, 1918, had increased by 48. The authorized capital of the companies had increased Y.140,000,000, and the number of slips, 140. Before the war the annual tonnage launched, of vessels of 100 tons and more burden, increased from 80,000 tons in 1913 to 700,000 tons in 1918. During the last term of business in 1918, the six largest shipbuilding companies made profits of more then Y.30,000,000.

The average of profit percentage on the basis of paid-up capital was 140 per cent. The fact that the Japanese shipyards were in a position to build 45 steamers, with a total tonnage of 375,000 tons for the United States government in exchange for steel, during the last years of the great war, is proof that Japan's shipbuilding efficiency had made great strides since 1913.

Recent Depression

The sudden end of the European war completely upset all these prosperous conditions. One after another newly opened shipbuilding yards were closed. After the financial crash of April, 1920, the depression in this industry was particularly severe. Between June, 1918, and June, 1921, the number of shipyards with a capacity of more than 1,000 tons decreased by 32, and the building slips of the same capacity decreased by 63. The tonnage of vessels constructed naturally decreased, the difference between the two dates given having been more than 203,000 tons, including sailing vessels of more than 100 tons burden.

On the contrary, while business was declining, the registered capital, and the issues of debentures, were increasing. This was largely the result of the increased needs for funds resulting from the panic. As a matter of fact, the six companies already mentioned made profits of only Y.7,452,000, during the second half of 1921, the percentage of profit to paid-up capital declining to 16.8 per cent.

The Washington conference's decisions concerning the reduction of armaments have had a further depressing effect on the industry, as the large shipbuilding yards have lost a considerable amount of work for the navy department.

The following table shows the condition of Japan's shipbuilding industry after the great war:—

	June 1918	*June 1921*
Number of shipbuilders	53	21
Authorized capital	Y.163,000,000	Y.204,000,000
Paid-up capital	109,554,000	142,950,000
Debentures issued	22,050,000	28,470,000
Number of yards	57	27
Number of slips	157	94
Number of workmen employed	95,197	72,893

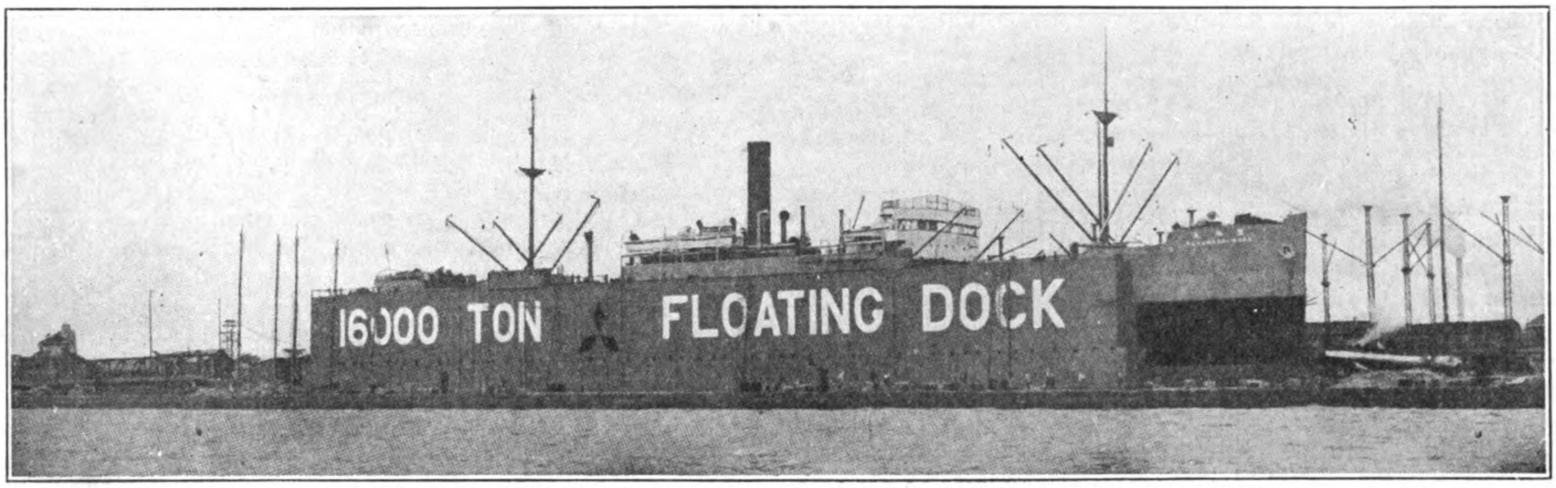
Position of Japan as a Shipbuilding Country

Before the great war Japan was hardly recognized as a shipbuilding country, but during the war Japan rose to third place in the amount of tonnage launched. In 1921 Japan dropped to fifth place. The following table shows this tendency:—

Shipbuilding According to Countries

	1913 (*Tons*)	*1919*	*1921*
United Kingdom	1,922,000	1,348,000	1,538,000
United States, seacoast yards only	228,000	3,580,000	995,000
Germany	465,000	——	509,000
Holland	104,000	137,000	234,000
Japan	65,000	612,000 (3)	227,000 (5)
France	178,000	33,000	210,000
Italy	50,000	83,000	165,000
Total including others	3,333,000	7,145,000	4,343,000

The development of the shipbuilding industry, it is not difficult to understand from what has been written before, has been due entirely to the continued protection of the government, and to the adventitious advantages derived from war. Before the great war the capacity of all the shipbuilding yards in Japan was so limited that the needs of the ever growing shipping trade were met only by large imports of tonnage from foreign yards.



The No. 3 16,000-Ton Floating Dock of the Mitsubishi Shipbuilding Company at Kobe

The special chance of the great war opportunity which gave Japan the third place in the amount of tonnage launched in 1919 has now passed. It is clear that the shipbuilding industry in Japan will continue to decline in importance and profit. There are two fundamental reasons why this will be so, the one the high cost of all shipbuilding material in Japan, and the other the extremely inefficient labor on which the industry must depend.

Japan is obliged to import practically all of its steel "shapes." There are some shipbuilding yards, it is true, which are equipped with machinery to manufacture steel, but their costs of production are prohibitive; importations are cheaper and of infinitely better quality. The costs of erecting the steel-making equipments is practically a dead loss to all the Japanese shipbuilding yards. In June, 1921, the Japanese government raised the import duties on steel, making its cost in Japan higher than ever, especially to an industry which depends on cheap steel materials to enable it to compete in the world's markets. In order to maintain stocks on hand for possible emergencies the fixed investments of all shipbuilding establishments must be much greater than the present condition of the money market, and the industry itself, warrant.

Despite an apparent advance in the efficiency of the Japanese laborer during the time of the war, his efficiency is still far below that of the workman abroad. Comparing the efficiency of the laborers in the Kobe shipbuilding yards with that of the laborers in the Weir yards in England, the efficiency of the British workman exceeds that of the Japanese by two to six times. The wages of these British workmen are only 328 per cent. higher than those of the Japanese laborers in the Kobe yards. It is not difficult to figure that Japanese labor costs are accordingly higher than the British labor costs. This comparison is based on the 1919 wage scale at Wier's, and the 1921 wage scale in Kobe. Even with wages in Japan at one-third of wages in foreign countries the costs of shipbuilding in Japan are going to be higher than those abroad.

These are the fundamental weak points of Japan's shipbuilding industry, but there are other weak points. The cost of equipment is higher than in other countries, and interest is higher. With a greater capital investment than that required in similar foreign concerns, and with interest from 3 to 10 per cent. higher than abroad, the position of the Japanese shipbuilding interests is decidedly not a happy one to-day.

The import tax of Y.10 a ton on foreign-built vessels more than ten years old, and of Y.15 a ton on vessels less than ten years old, does not make it possible for Japanese shipbuilders to compete with foreign yards for Japanese business even. In such case it is difficult to believe that the future of this industry in Japan is at all promising.

It is impossible for the government to extend more assistance to the shipbuilders without seriously disturbing the present balance of the nation's economics. The only means of getting the industry out of the hole it is now in are somewhat as follows:

1. Capital decreases to be carried out on a large scale thereby permitting dividends to be paid out of present business.

2. Mergers of existing concerns to be carried out under the direction of the most efficient companies.

3. Conversion of equipment, in part or all, to the production of other commercial products.

Even if mergers should prove impossible to bring about a syndicate should be organized to effect mutual savings on the purchase of equipment; to confine certain classes of work to certain yards; to establish a common reserve of materials, which could be drawn upon by all members at need, even in excess of their proportions.

Conversion to other lines of industry has been carried out by the Yokohama Dockyard and the Ishikawajima Shipbuilding Co., in some part with not indifferent success. Other companies will probably be compelled in time to follow their examples.

S.M.R. Development Schemes for 1922-1923

In order to further its development schemes (the majority of which have already been contracted for), the South Manchuria Railway Company has set aside the sum of 30,000,000 yen, with a reserve of 5,000,000 yen. In addition, the Company has a reserve of 18,000,000 yen brought over from the previous year. The principal works to be carried out, together with the amount to be expended thereon, are shown in the following table:—

	Yen.
Railways	8,466,271
Local administration	6,902,913
Mines	4,445,529
Electrical undertakings	2,007,881
Harbor works	1,710,171
Gas works	1,618,289

The proposed railway work includes the building of an additional track between Tiehling river and Chungku (13 miles), Chuanton and Shuangmiaotze (6½ miles), and Suchiatun and Wuchiatun (on the Antung line, 5.7 miles), rearrangement of the tracks on the Dairen wharves, and the provision of a bridge over the Tazeho. In addition to the building of a passenger bridge at Mukden station, the purchase of covers and sheets for the storage of general goods, it is proposed to install automatic signals at Mukden and Suchiatun, and rearrange the inter-routing of further signals at the principal stations. The scheme further includes the building of nine new goods locomotives, twenty passenger cars, seventy goods wagons, and the rebuilding of others on hand.

Local Administration

A new hospital will be built at Kirin, and additions will be made to the existing hospitals at Dairen, Wafaugtien and Tashichiao. It is also proposed to build a new school at Antung, and a public school hall at Fushun. Additions are to be made to the Mukden Middle School to serve as a preparatory for the South Manchuria Medical College. Roads and waterworks will be repaired and extended at Dairen, Antung, Kaiyuan and Mukden, and additional houses will be built for the employees at Harbin. It is further proposed to erect a seed supplying station at Kaiyuan and Changchun, and an agricultural experimental farm at Paintara in Inner Mongolia for the development of agriculture in that district.

Mining Work

The development of the open-cut mine, "Ronhoko," will be proceeded with, and includes the purchase of machinery, the laying down of additional railway tracks, and the provision of safety devices in the mines. In order to increase the quantity of tar obtained from the Lymu gas producer, a link, low temperature distillation apparatus will be installed. Repairs and extensions to waterworks and roads, and the building of additional houses for employees, are also provided for.

Electrical Development

The electrical schemes proposed include the continuation of the third power house at Antung and the transformer house. At Shakakou (Dairen), and the extension of the Changchun electric works. An ample supply of electric fixtures to the residents of Dairen, Mukden, Changchun, Antung and other places is also provided for. The tramways in Dairen will be extended, and additional passenger cars provided.

Harbor Works

The reclamation work begun two or three years ago at Jijiko and Shokoshi (east and west of Dairen respectively) will be continued and in addition the present dangerous goods pier at Jijiko will be rebuilt and the widening of No. 2 wharf completed.

Gasworks

It is proposed to complete the "third term" extension of the Dairen Gasworks; the proposals also include the building of further gasworks at Mukden and the laying of gaspipes at Dairen.

Japanese Builders Adopt American Methods

THE steel frame reinforced concrete building has come to stay in Japan. The movement for building reform started in 1917 resulted in sending Japanese architects abroad to study the best type of building construction adapted to the peculiar requirements of the country. With the placing of the contracts for the erection of the Mitsubishi, N.Y.K., and Nippon Oil buildings with the George A. Fuller Company of the Orient, a new era in building construction was ushered in. As a result of this co-operation, in which the Japanese have been educated in the most approved methods of modern American construction, several native firms have come to the front specializing in steel and reinforced concrete work.

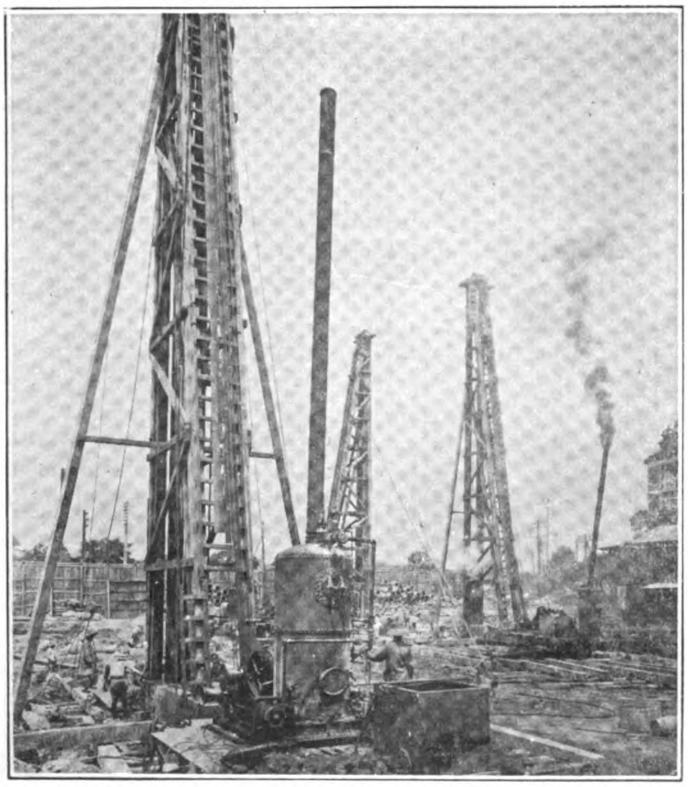
One of the best known Japanese construction and contracting companies, is the Shimizu Gumi, the oldest building concern in Japan. It is in business over 170 years and has erected many of the older office buildings of the capital. At the time of the Meiji restoration, this company constructed the Mitsui Kawase Za, the first modern bank in Japan, and which is now known as the Dai Ichi Ginko or First Bank. The concern was reorganized in October 1915 as a limited partnership (Goshi Kaisha) with a capital of Yen 3,000,000, and under the management of Mr. Kugokichi Simizu has since undertaken several important contracts for the erection of new buildings in Tokyo and throughout the principal cities of Japan. The firm has its own workshops at Shimada-machi in Fukugawa-ku in Tokyo and maintains branches in Yokohama, Kyoto, Osaka, Keijo and Dairen.

Elevation of the new Building erected by the Shimizu Gumi for the Katakura Raw Silk Spinning Company, Ltd., Tokyo

Another very old and successful construction firm, is the Obayashi Gumi whose headquarters are at Osaka. This is now a limited liability company with a capital of Y.2,000,000 half paid up, under the presidency of Mr. Y.Obayashi. It has branches at Tokyo and in Fukuoka prefecture last year declared a twenty per cent. dividend.

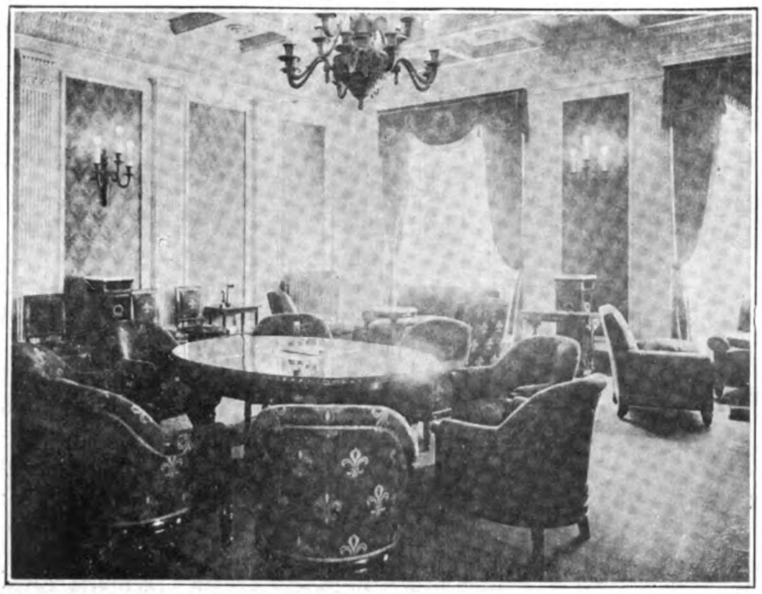
Tokyo Home of the Bank of Chosen

Keeping abreast of other important Japanese financial institutions, the Bank of Chosen, whose headquarters are located at Seoul, Korea, has just completed a magnificent six-storied new home in the heart of the financial district of Tokyo. This building, like others in the district, is of steel and reinforced concrete with the south and west and part of the east outside walls covered with granite up to the second floor, with white stone facing on two sides



Driving piles for the foundation of one of Tokyo's Office Buildings

Toyama Industrial Library. A handsome new structure in Shiba-ku, Tokyo



Reception Room

Directors' Room

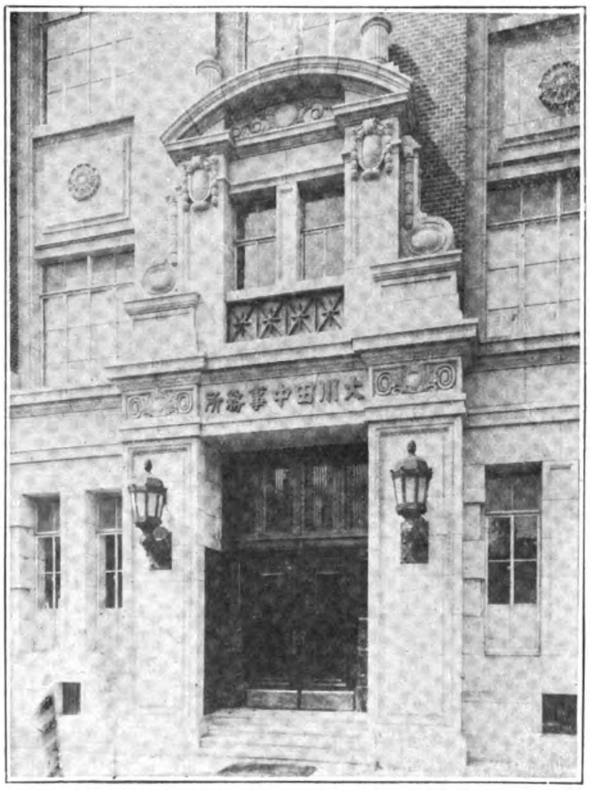
Okawa-Tanako Office Building, Tokyo, erected by the Shimizu Gumi for Messrs. H. Okawa and E. Tanaka

up to the lower edge of the windows of the fifth floor and the other two sides with artificial stone. The ground area is 2,400 square yards, of which 992 square yards are occupied by the edifice. The total floor space is 5,276 square yards with 150 square yards of attached boiler and motor house. The height to the upper edge of eaves is 97 feet.

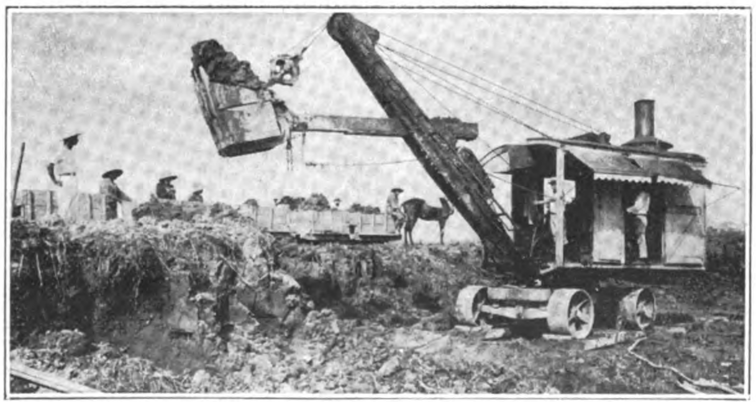
Inside walls and ceilings plastered and part of the walls finished with cloth. Floors are covered with linoleum, German tiles and hardwood. The dado and pillars of the main parts of the building, customers' waiting and reception rooms, the great hall on the fourth floor, are finished in marble, while in the rest of the building the dados and trim is hardwood.

The mechanical equipment of the building includes a power house containing a sectional German steam boiler, which supplies steam heat for all the rooms in the building and for operating a 50-kilowatt generator. Gas is supplied for a special kitchen in the basement. In addition, an automatic water supply pump is installed in the basement for keeping the tank on the roof filled for the general service of the building.

The building was designed and its erection superintended by Mr. M. Kuzunishi, Dr. of Engineering. The contractors are the Shimizu Gumi.



Entrance to the Okawa-Tanaka Building



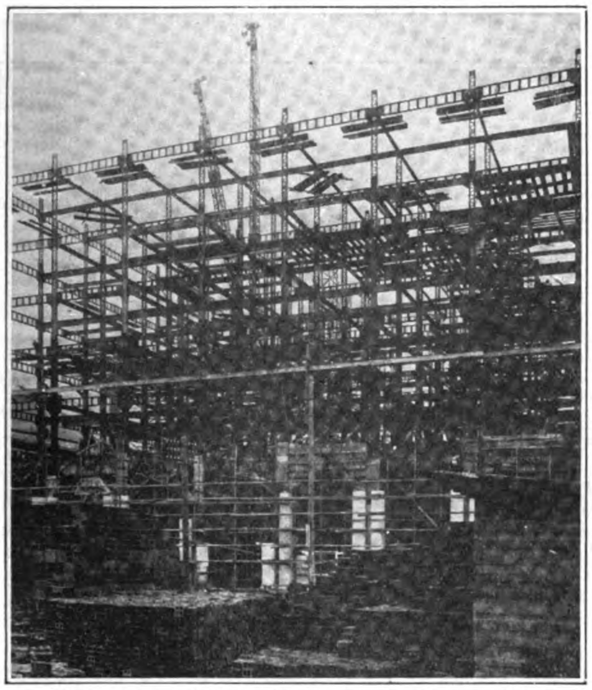
An Erie Steam Shovel used by the Shimizu Gumi in Excavating Foundations in Tokyo

Okawa-Tanaka Office Building

This handsome new five story office building, located at No. 1 2-chome, Eirakucho, Kojimachi-ku, in the Marunoichi district of Tokyo, was commenced in April 1920 and completed in March of this year. The area of the building is 946 square yards with a total floor space of 4,630 sq. yards, height of 100 feet to the top eaves. The building is of steel frame with reinforced concrete walls finished in granite, white and artificial stone. On the first floor are the offices of the Okawa-Tanaka Company and on the second the directors' rooms while the third, fourth and fifth are for rent. The mechanical equipment includes various elevators, with a steam plant in the basement for electric lighting and elevator power.

Nippon Kogyo Ginko (Industrial Bank of Japan)

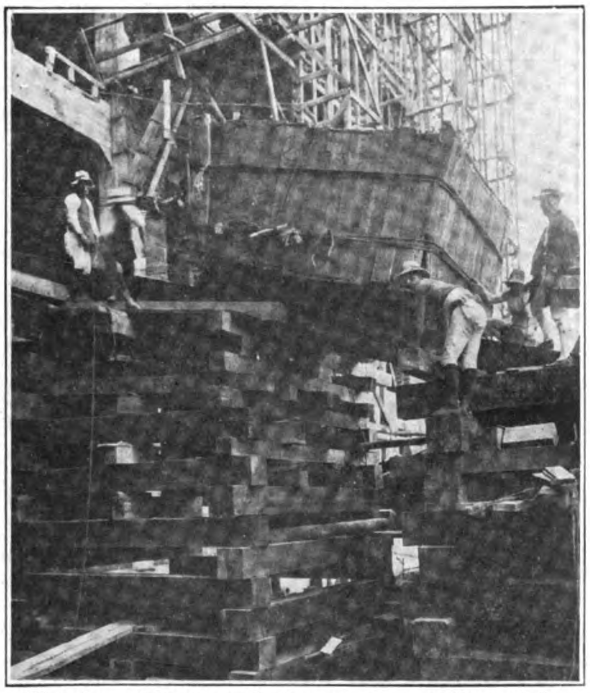
This eight story edifice is going up in the heart of the Tokyo financial district at Eirakucho, Kojimachi-ku, and covers 2,244 square yards of land, with an aggregate floor space of 16,240 square yards. The style is modern renaissance, steel frame, reinforced concrete with brick facing. The building will be about 120 feet high to the upper edge of the parapet, erected on a pile foundation with a concrete covering. All steel work is covered with reinforced concrete as well as the floors and staircases. In addition to the main structure there is a reinforced concrete garage and warehouse attached. The engineering equipment consists of a steam boiler for general heating and for supplying steam for an electric light and elevator power generator, water supply, filtering apparatus, etc.



New Office of the Nippon Kogyo Bank. Now under construction in Tokyo: Contractors: The Obayashi Gumi

Katakura Raw Silk Spinning Co., Ltd.

This is an eight story front and ten story rear building under erection in Tatami-cho, Kyobashi-ku, Tokyo, 125 feet high from the pavement to the top of eaves and 150 feet to the highest part of roof. It covers 1,146 square yards with a total floor space of 8,100 square yards. The entire structure is of reinforced concrete with the outside walls finished with granite fancy brick and artificial stone. The ground floor is devoted to the engine room which is equipped with a steam heater for electric generator, hot and cold

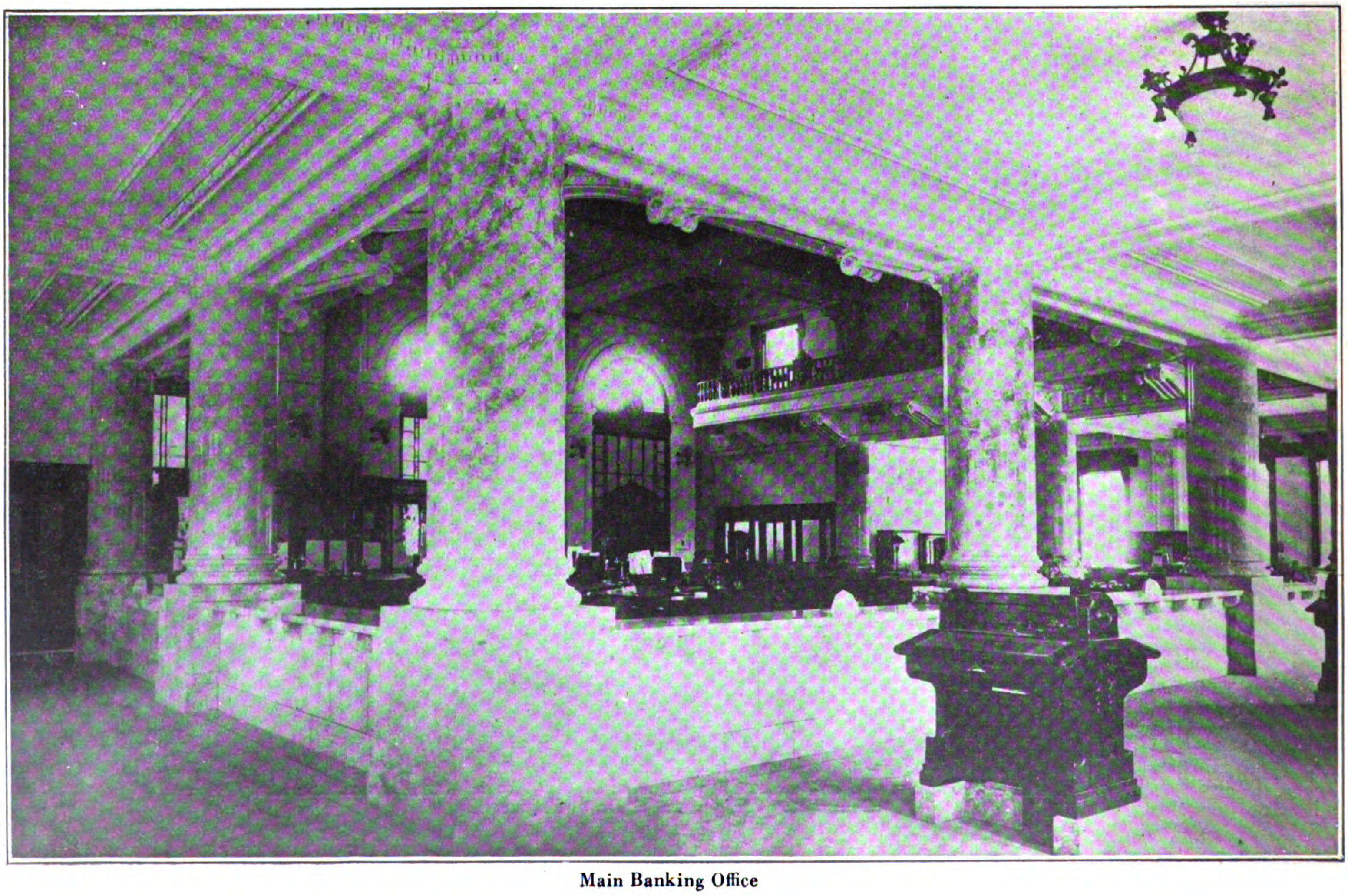


Hoisting a 25-ton vestibule top to the 2nd floor of the Nippon Kogyo Bank building

New Tokyo Branch of the Bank of Chosen erected by the Shimizu Gumi: Architect and Superintendent of Construction, M. Kuzunishi, Dr. of Engineering

TOKYO HOME OF THE BANK OF CHOSEN

Foreign Banking Department

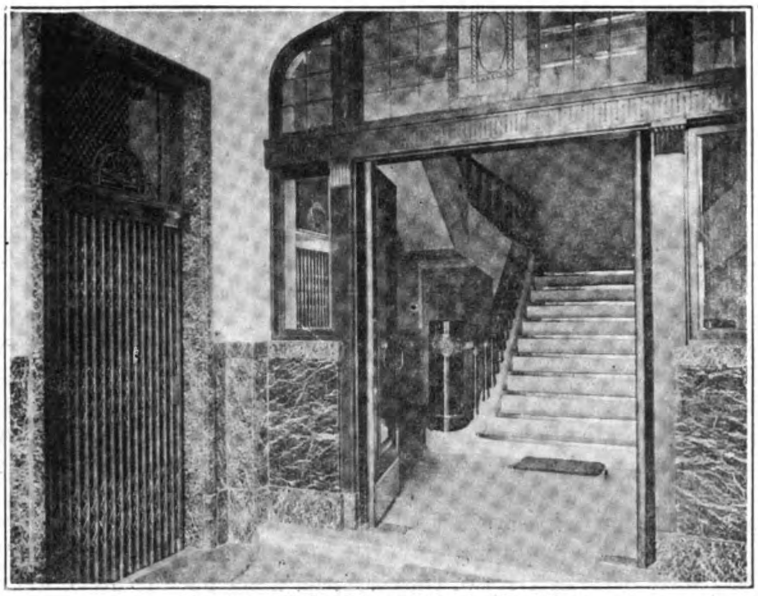


Main Banking Office

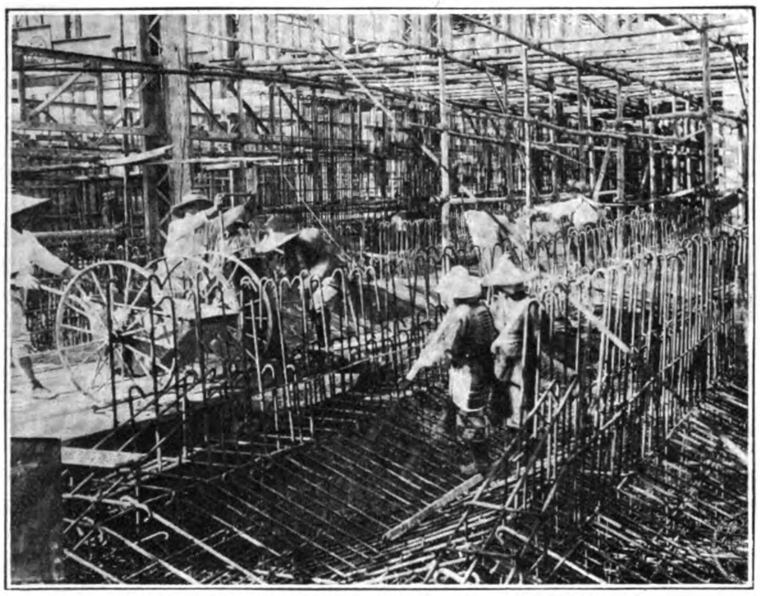
water supply, radiators. The building is fitted for gas and electricity with telephones in all rooms. Modern sanitary arrangements are provided for, discharging into a septic tank on the premises. The first floor is devoted exclusively to the use of the company and the second, third, fourth and fifth to offices for rent. On the sixth floor are located bed rooms for company employees and with baths and closets, while the seventh floor is given over to dining and conference rooms.

Fujiyama Industrial Library

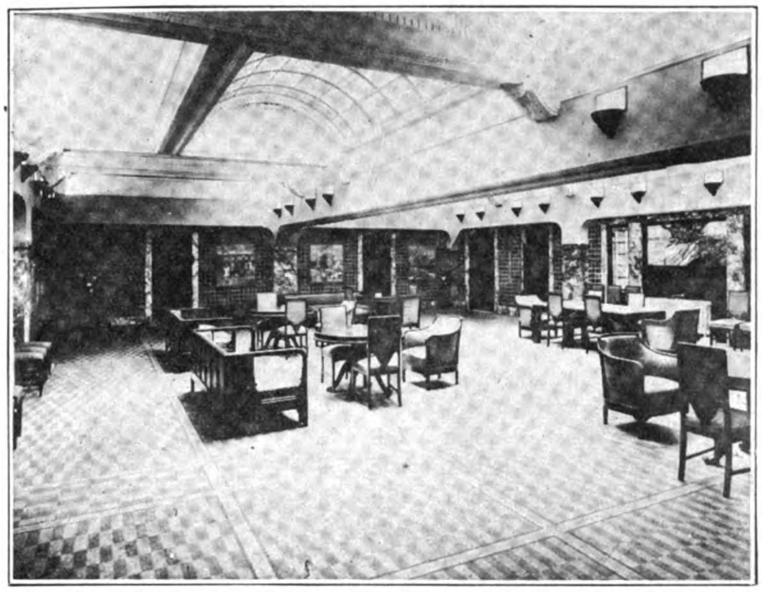
Located in Shirakane Daimachi in Shinba-ku, Tokyo, this building will be three storys high and in parts five, with a height of 105 feet and total floor space of 534 square yards. The building is of red-brick with fancy brick and granite facings and trimmings, with part wooden and part reinforced concrete floors. In the basement is a steam and gas heater and water filter, billiard, rest room, bar, baths, etc. On the first floor is the office, reading and smoking rooms and study. The second floor has a dining saloon, lecture hall, conference and smoking rooms.



Entrance Hall: Okawa-Tanaka Building



Concrete Foundation Work by the Shimizu Gumi



Reception Room in the Tokyo Branch of the Bank of Chosen

N.Y.K. Rapid Express Service Liners

(*Continued from page 690*)

three sides, admitting a plentiful supply of light and air. A large well, opening into the social hall above, is surrounded by highly decorative bronze railings. The panels are painted in a soft shade of grey with mouldings picked out in white, after the manner of the exquisite "Petit Trianon" of Versailles. These, together with the very fine and appropriate furniture of the apartment give the saloon a refined and elegant appearance. The color scheme of curtains, etc., adds much to the beauty and attractiveness of the room.

The social hall is excellently planned and elegantly furnished, the color scheme being similar to that adopted for the dining saloon. There is a marble chimney-piece with an electric "magical fire," surmounted by a fine mirror in an ornamental gilt frame. The furniture, which is designed to afford comfort as well as aestehtic pleasure, is in the refined "Period" style, and includes a semi-grand piano.

Generally speaking, both the dining saloon and social hall are in the style of the Louis Quatorze period. The former room has as a character feature a very quiet and reposeful aspect, depending for this effect upon good proportions and refined detail in decoration, whereas the furnishing and decoration of the latter room are treated on brighter lines,so as to produce an air of cheerfulness and sociability.

The smoking room on the promenade deck is panelled in French walnut, similar in style to that which prevailed in England druing the "William and Mary" period, having a slightly Dutch influence in its detail. The centre of the room is high and has a segmental plaster ceiling with a large decorative wrought-iron and glass skylight. Sofas, easy chairs, card tables, all of the same "Period" style and a very, handsome chimney-piece with embellished carvings, etc., complete the furnishing and lend much to the restful effect of the room.

A verandah café, comfortably equipped with wicker chairs and settees adjoins the smoking room.

The entrances and staircases are panelled with dull-polished light-coloured French walnut. The handsome wrought-iron railing, of highly artistic design with dull-polished bronze handrails are the distinctive features which make the entrance hall extremely pleasing to the eye.

There are various kinds of staterooms, including an *en-suite* set, single berth, double berth and four berth cabins, etc. with different passage rates, thus offering a wide choice of accommodation to passengers.

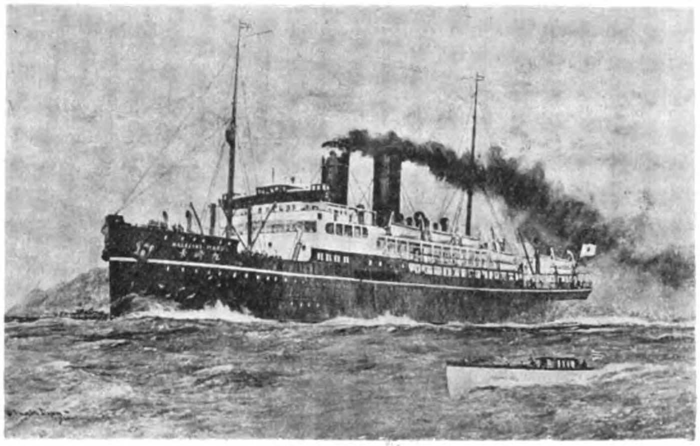
The rooms *en-suite* consist of a sitting room, a bedroom and a dressing room. The fittings and furniture in these rooms are of the best artistic taste and designs. All the staterooms are completely equipped and thoroughly fitted with the sole object of creating a domestic atmosphere and giving home-like comfort to the occupants.

A remarkable improvement will be introduced in the third-class accommodation. Every attention will be paid securing enlargement of space, efficient ventilation and lighting, and complete sanitary arrangements. Independent dining, smoking and bar rooms of European style will be provided in addition to a public room with matted floor, supplied with chess boards and other means of amusement *a la Japonaise.*

N.Y.K. Rapid Express Service Liners

Important Contribution to the Development of Shanghai

SINCE Shanghai was opened to foreign trade and residence in 1844, it has grown from a port of small commercial importance to one of the greatest of shipping and trade, not merely in the Orinet, but also in the world. Shipping is, of course, the principal source of life of the city, and the best idea of the immense development thereof may be gained from the fact that a total of 22,431,699 tons entered and cleared from Shanghai during 1921. This tonnage is dominated by British vessels, representing 8,287,470 tons or 37 per cent. of the total. Japan ranks second, representing 6,663,201 or 30 per cent. Of the various steamship lines engaged in the shipping trade of Shanghai, the N. Y. K. occupies a pre-eminent position, controlling by far the greater portion of the Japanese shipping of that port. The activity of the N. Y. K. dates back to 1885, when the branch office was established there, and it was by dint of steady application and unremitting endeavors that the present foremost position has been attained. The N. Y. K. office, godowns and wharves occupy and ideal place on the river front in the central part of the city. All the buildings and wharves are of considerable dimensions, and are equipped with all the modern arrangements for the convenience and facility of shippers as well as passengers. At the time of inception of this service the N. Y. K. operated two steamers of 3,000 tons gross each. But now it has 27,608 tons of shipping exclusively devoted to its Japan-Shanghai services, namely, the Yokohama-Shanghai line and the Osaka-Kobe-Shanghai line. Besides, most of the N. Y. K. ocean-going liners bound for Europe, India, Africa, and north and South America make regular or occassional calls at Shanghai on their trips east and west.



N.Y.K. Steamer

Thus is will be seen that within the past 37 years the number of the ships have increased by leaps and bounds, and the character of the services has also been improved in a remarkable degree, thereby contributing much to the promotion of trade and friendly relations between Japan and China. A further improvement is now being contemplated by the N. Y. K. Two fast steamers of 5,500 tons each, exclusively designed for the carriage of passengers on the Shanghai route, are now under construction by Messrs. William Denry's Shipbuilding Yard, Dumbarton, Scotland. They are to be christened the *Nagasaki Maru* and *Shanghai Maru* in honor of their official terminal ports. The former steamer was launched in the Scottish shipyards on March 14 last and the latter vessel took the water on August 23. As soon as their equipment is completed, they will be brought over to the Japanese waters to be commissioned on the service.

The advent of these two vessels on the service will mark a new era in the traffic facilities between Japan and China, as the steamers will be able to make the crossing between Nagasaki and Shanghai in about 26 hours instead of the 36 hours taken by the vessels now in service. Thus, travelers between points in Japan and Shanghai, or *vice versa*, will be able to economize time to a considerable extent, a similar facility and advantage being enjoyed by passengers between Japan and interior points in China. Special consideration will also be given to scheduling the departures and arrivals of the steamers so as to facilitate connections with the railways in Japan and China. In fine, the N. Y. K. confidently believe that the new fast steamers will give the traveling public entire satisfaction and that the realization of the scheme in the immediate future will estahlish one more link to unite in friendly relations the countries of China and Japan.

Particulars of the New Liners

Particulars of the new vessels are as follows :

Gross tonnage	about 5,500
Displacement	6,150 ft.
Length O. A.	410 ,,
Breadth	54 ,,
Depth	32 ,,
Speed	18½ knots
Passenger accommodation :	
1st class	157
3rd	300

These steamers are built under Lloyd's special survey and comply with all the latest board of trade requirements for passenger ships. The doors of the water-tight compartments are operated from the navigating bridge, so that the Captain can have instantaneous control over their complete system. The vessels are driven by twin-screws worked by single, geared reduction turbines of the Parson type, which reduce the vibration of the engine to a minimum, thereby ensuring the greatest comfort of the passengers. There are ten Scotch boilers working at a pressure of 200-lbs. The steamers are thoroughly equipped with modern life-saving appliances. All life-boats are worked by mechnical davits and motor winches. There is a set of emergency electric generators on the boat deck in addition to three powerful sets for ordinary use, and can be used at any time to supply electric current for wireless telegraphy, lighting, pumping, etc.—a most powerful asset in the event of accident. Precautionary arrangements for fire prevention are perfect. There are a number of fire-proof bulkheads and doors dividing the whole living quarters into many smaller sections, Each section is fitted with fire extinguishing apparatus of the latest pattern.

In regard to wireless installation, sanitary arrangements, and other equipment, the ships are in no particular behind any of the newest Atlantic liner. Needless to say, the utmost attention and consideration will be given to the arrangement, construction and furnishing of the public rooms and the staterooms, so as to give passengers the maximum of comfort and convenience, the greatest satisfaction, and even luxury. All parts to be occupied by passengers are specially well ventilated, and lighted. Perfect taste has been displayed throughout in the matter of style and decoration. The steamers will carry two classes of passengers, namely, first and third classes. The first-class accommodation is amidships. The public rooms include a large dining saloon, a spacious social hall as well as a comfortable smoking room and a bar. The other features are a verandah cafe, and an inqury office, and unusually ample space devoted to the recreation and exercise of passengers.

The dining saloon is located on the awning deck forming the front part of the erection and has a large number of windows on

[Continued at foot of previous page]

The Machine Tool Trade of Japan

JAPAN buys all classes of machine tools—lathes, turret lathes, milling and drilling machines, gear hobbers and shapers, horizontal boring machines, planers, shapers, slotters, grinders of every description, electric and pneumatic tools, and many special machines. Machines are purchased in all sizes, from the bench lathe to the heavy gun turning lathe, and other machine tools in similar proportion. It is easier to say what machine tools Japan is not buying as yet—that is, machines for quantity production. In this respect Japan is far behind England, the United States and the more progressive continental countries. A few branches of the Japanese industry have begun to use automatic and other special machines for quantity production, and this precedent is being followed by smaller shops, as finances permit.

In woodworking machines the staple types of band, circular and gang saws, planers, etc., form the bulk of the business, although there is some trade in special machines for certain industries.

The Government is the Principal Buyer

The most important buyer is still the government (army, navy, state railways, etc,). The electric, shipbuilding and general machine-building industries also are large consumers of machine tools. Of course, there are numerous other buyers, such as bicycle makers, repairs shops of the big sugar, paper and spinning mills, and many others. The automobile industry is still in its infancy and is likely to be of slow growth. High production cost, a small market and oppressive taxation militate against its success.

The imports of metal-working and wood-working machines in 1920 were valued at 13,650,000 yen (approximately £1,400,000). In addition there is a home industry which in that year produced machines to a value of nearly 10,000,000 yen. The figures for 1921 are not available yet, but doubtless are much below these figures. During the present year, both imports and home production have receded further, as the government is buying little, and only a few of the private industries are prospering.

American and British Exports to Japan

In 1920 the United States sent to Japan 10,964,000 yen (£1,127,-000), and Great Britain 2,573,000 yen (£263,000) worth of machine tools. Imports from other countries were insignificant in 1920, but now imports from Germany are appearing on the market again.

VALUE OF MACHINE TOOLS AND METAL-WORKING MACHINERY EXPORTED TO JAPAN IN 1921

Month	Lathes	Sharpening and Grinding Machines.	Other Machine Tools.	Total of Machine Tools.	All Other Metal-working Machinery.	Total of Machine Tools and Metal-working Machinery
	£	£	£	£	£	£
January ..	19,600	17,980	11,810	49,390	72,700	122,090
February ..	9,230	3,690	20,100	33,020	42,750	75,770
March ..	7,700	957	11,770	20,427	32,800	53,227
April	8,870	2,970	1,410	13,250	35,280	48,530
May	2,030	1,990	3,878	7,898	10,210	18,108
June	98	1,170	14,050	15,318	107,500	122,818
April	9,160	1,390	2,290	12,840	13,750	26,590
August.. ..	271	1,302	1,440	3,013	7,550	10,563
September ..	1,660	3,280	7,910	12,850	4,400	17,250
October ..	1,405	2,340	3,445	7,190	5,490	12,680
November ..	—	1,690	4,840	6,530	6,940	13,470
December ..	1,846	1,988	5,535	9,369	11,100	20,469
Total ..	61,870	40,747	88,478	191,095	350,470	541,565

Automatic Machine Tools in Japan

By Arthur Jackson, M.E.

THE present industrial depression has come as a blessing in disguise to Japan, causing her to pause and take stock of her manufacturing methods. Engineering firms found themselves confronted by a very formidable foreign competition in manufactured goods of superior quality and cheaper in price, this in spite of the fact that a heavy protective duty has been levied. The question was asked, how is it that foreign countries can successfully compete with Japan in view of the fact that workmen are paid ever so much more than the Japanese and heavy, freights, duty, etc., paid on all imported goods? The answer was not a difficult one, and the Japanese soon learned that America, England and the European powers compelled by the stern necessity of war, equipped their factories with the very latest types of automatic machinery and labor-saving devices. Directly the war ended these enormous industrial plants were changed over from the manufacture of munitions to the manufacture of articles of peace. These products commenced to flow into Japan to the detriment of the home manufacturers. Then the question arose, how are we going to successfully meet this foreign competition ? Shall we raise huge tariff walls so high that foreign products cannot scale them ? It was immediately recognized that there would a great danger in that, as it would shut out the latest foreign inventions, upon which Japan relies to a great extent in her forward march in the civilized world. Wide awake manufacturers realized that to meet foreign competition it was necessary to use the same methods as their competitors or better. To-day the words " Do it automatically " is the motto of every progressive Japanese engineer. Fortunately, many manufacturers have awakened to the fact that the trend of the times requires automatic machinery whenever it can be employed. Instead of installing an automatic machine when the conditions are such that no one could possibly doubt its economic advantage, the Japanese manufacturer usually reverses that progress and takes it for granted that he must specify an automatic unless he can clearly show that it would not pay. When the war ended and it again became possible to purchase automatic machinery from America, some of the leading manufacturers of Japan took advantage of this opportunity and installed batteries of automatic machines in their works, and are now enjoying exceptional prosperity, especially is this so with the leading manufacturers of electrical appliances, bicycles, phonographs, etc.

Following their lead, a large number of other manufacturers have commenced to use automatics and the demand for these machines is now very brisk. It is believed that more automatic machines have been imported into Japan in the last two years than any other type of machine tool.

Not only the largest, but also some of the smallest Japanese firms have installed and are using automatic machines with unqualified success. The most remarkable instance being the Goto Iron Works of Kameido, Tokyo, which is practically a private house and factory all in one. They are so up-to-date that they have ball-bearings throughout their lines shafts. Among their machine tools are to be found three of the latest types of bar working automatics, one of these being a $\frac{7}{8}$-in. Gridley multiple spindle automatic, which was turning out handles for safety razors from brass bars at the rate of 500 per hour, when the writer last visited these works, and on a previous visit they were making brass caps for bicycle valves at the rate of 600 per hour. The largest and most progressive manufacturing firm in western Japan has recently installed an 8-B Potter & Johnston automatic chucking, turning, boring and threading machine, which is believed to be the largest type of fully

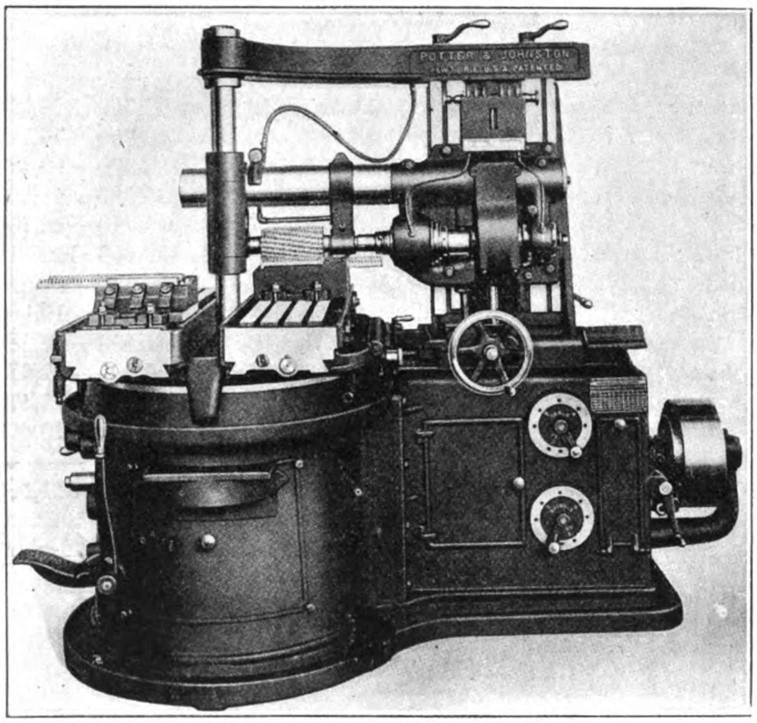


Fig. 1. Horizontal Automatic Milling Machine.

automatic machine tool now built. It is able to machine a casting or forging of 35-in. in diameter. This machine is also very unique owing to the fact that all its mechanical functions are controlled entirely by compressed air, that is to say, all its speeds and feeds are changed by this means as required by the cutting tools to enable them perform the required functions during their various operations. This particular machine is to be employed in machining aeroplane engine cylinders complete from steel forgings. The attendant's only duty is to place the rough castings in the machine, to take them out when completed, and keep the cutting tools up to their required sharpness.

Fatal errors have been and are being made by some of the firms starting up new enterprises by engaging foreign engineers abroad and leaving it to their judgement to select machines for the new factories. These engineers knowing nothing of conditions in Japan, erronously conclude that Japan is not ready for modern methods and chose out-of-date machinery that they would not dream of using in home factories. The result is that instead of these factories making a profit they are hopelessly handicapped from the very beginning. The shareholders are usually called upon to furnish additional funds for new equipment. Often they refuse and the enterprise ends in a failure. The bogie that Japanese, Chinese or other Asiatics cannot work the up-to-date machine tools has been almost entirely dispelled. For the modern automatic machine is not so difficult to set up and operate, as the hand-operated machines of a decade ago, and, what is more, much less skilled labor is required. For only a few skilled men are required to set up these machines for a new class of work, and when this is done, the machines can be left in the charge of mere boys or women to keep them supplied with fresh materials and to take away the finished products. The work is of a much greater degree of accuracy than is possible by the hand method, and each part made is exactly interchangable with another. When we take a look at the Japanese factories at the present time we find that those that are successful and are now

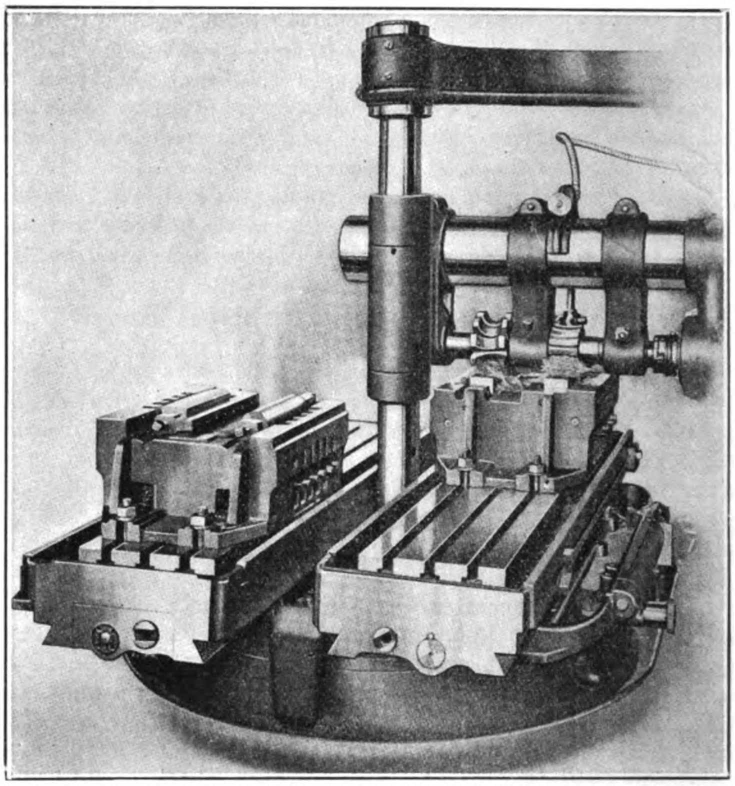


Fig. 2. 2-M HORIZONTAL AUTOMATIC MILLING MACHINE.

Operation Milling radii : 5 pieces held in fixture, making total length of cut $6\frac{9}{16}$ inches. These fixtures are designed to carry two rows of 5 pieces, each row representing a different operation, after the first cut, and the table has revolved to its loading position, the pieces are reversed in the fixture and is then ready for milling the radii on the opposite ends. In this way two operations can be performed without waiting for one operation to be completed.

making a profit are those who are relying upon automatic machinery, while those who are badly feeling the effects of the depression are those who rely on obsolete hand methods. The Shibaura Engineering Company of Tokyo, now enjoying well-deserved prosperity, have been foremost in installing up-to-date machinery. They now have entire batteries of automatic machines in operation and are gradually replacing all hand work by automatic machinery. The other leading electrical engineering companies are falling into line.

The writer, who has had considerable experience in pioneer work in connection with the introduction of automatic machinery in various factories of the United States, Canada and Great Britain, experienced a tremendous amount of opposition from the workers in the countries named, he expected the same or more in Japan, and was advised that such would be the case, by people who were in a position to speak with authority on the subject. But contrary to all expectations, he has not had the slightest objection raised by the workers in any of the Japanese factories where he has installed these machines. Instead of opposing the workers have only been too eager to render every assistance to get the machines started, and have always been very keen to try to obtain the very best results. This has been true of workmen in the government factories as well as those in private engineering workshops.

Automatic machines used for general engineering purposes are divided into three distinct classes, i.e., automatic milling machines, automatic chucking machines and automatic bar working machines. The automatic milling machines are again divided into two types. One type has a large turntable on which is mounted two independent work slides. Each slide will take a work fixture in which gangs of articles to be machined are held. The machine is so arranged that the operator can take the finished work off, and put the new work on, one slide, while the work on the other slide is being milled. This machine is able to do the work of two or more of the ordinary types of milling machines. The other type of automatic milling machine has two turntables instead of one, and will take four work fixtures instead of two as on the former type, and not only can all these four fixtures be used for one particular job, but two can be used for one job and two for an entirely different job, and even of different material, so that two distinct jobs can be performed at the same time. This type of machine can thus perform the work of four or more of the usual type of milling machine to be found in engineering factories. The automatic milling machine having one turntable with two work fixtures is known as the 2-M for horizontal and 2-V for vertical work, and the machine with two turntables and four work fixtures is known as the 1-M style. The Potter & Johnston Machine Company have been most successful in introducing such machines in Japan for milling electrical appliances, breech blocks, turbine blades, cycle cranks, etc. Eighteen cycle cranks are held in each fixture at one time, and the total time taken to complete one crank is one and a half minutes. The illustration (No. 1) shows the 2-M machine machining geared racks. The close up view (No 2.) shows the same machine set up to machine radii on machinery steel blocks. Five pieces of work are held in each fixture making a total length of cut $6\frac{9}{16}$-in. The fixtures are designed to carry two rows of five blocks each, each row representing a different operation. After the first cut has been taken, and the table has been revolved automatically to its loading position, the pieces are reversed in the fixture and is then ready for milling the radii on the opposite ends. In this way two operations can be performed without waiting for the other one to be completed.

Engineers will recognize the advantages of using the automatic milling machines as compared to the older types, that demand large floor space, additional labor and other overhead expense.

The Potter & Johnston chucking automatics are built in four sizes, namely, 5-A with 17-in. swing, 6-A having 21 $\frac{7}{8}$-in. swing, 6-B 23-in. swing (vertical) and 8-B with 35-in. swing. These machines are all horizontal type, except the 6-B, which is vertical. The 6-B machines was especially designed for the Ford Motor Car Company of Detroit, U. S. A., and was made vertical to economize floor space. The 5-A size machine is principally used in Japan for the machining of fan motor bodies, cycle hubs, water meters and for numerous other purposes. The machining of fan motors usually takes about four minutes, and the cycle hubs about six minutes on this size machine. The 6-A size is mostly used in Japan for the machining of the end shields for motors from $1\frac{1}{2}$ h.p. to 25 h.p. taking from three to twenty minutes according to the size being machined. These machines are also being used to machine trolley pulleys, trolley wheels, gear blanks, bushings, pulleys, etc. Figure 3 shows a 6-A machine at work machining $7\frac{1}{2}$ h.p. motor end shields in $7\frac{1}{2}$ minutes each, and was taken at the machine tool exhibition held in Osaka last November. This machine was the object of considerable attention from the large number of engineers that attended this exhibition. The close up view (Fig 4) shows the tools used on this job, which included rough and finish facing, rough and finish bore also recessing for oil groves. The limit of error allowed in the boring of the hole was .0005-in. and this limit was easily maintained. In work of this kind the roughing tools are only sharpened once a day, and the finishing tools usually last a week before they require regrinding. One operator is also able to attend to four machines and sometimes more. The 6-B machine is principally used for naval ordnance work. The 8-B machine which represents the very latest design of automatic machine tool is most suitable for the machining of engine cylinders and car wheel centres, breech blocks of heavy guns, gun carriage hubs, end shields for large motors, etc. In the plant of the General Electric Company at Schenectady, U.S.A., they are machining the end shields for their 50 h.p. motors, which are 28-in. in diameter, on this machine. taking twenty-eight minutes to fully complete each one. This is about a third of the time taken on the boring mills that are generally used on this class of work. The boring mill will requrie one man on each machine, whereas the automatic will only require one man for four machines on this particular job. The foregoing chuck work automatics are so designed so that they will be able to machine up any kind of casting, forging or cut-off bar stock, and will perform any kind of machining operation as may be required, such as turning, drilling, boring, reaming, knurling and threading. When they are to thread outside work it is customary to use automatic self-opening dieheads, and for inside tapping automatic collapsible taps, the turret that carries the die head or tap is so arranged to advance forward at exactly the same pitch as the thread required to be cut.

Tools for drilling, boring or reaming are also held in the turret, which has four or more faces according to the requirements of the work to be done. Tools for facing, or forming are held in the cross

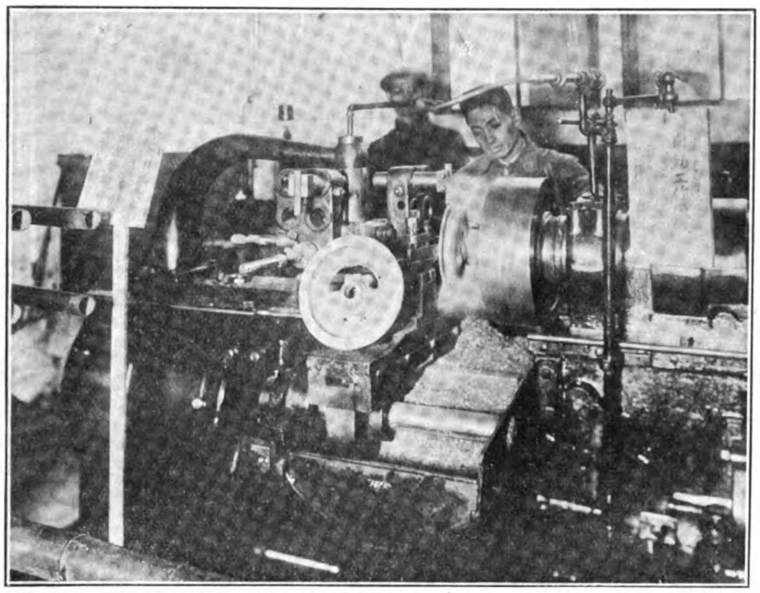


Fig. 3. Automatic Chucking Machine, at work machining $7\frac{1}{2}$ h.p. Motor and Shields in $7\frac{1}{2}$ minutes each

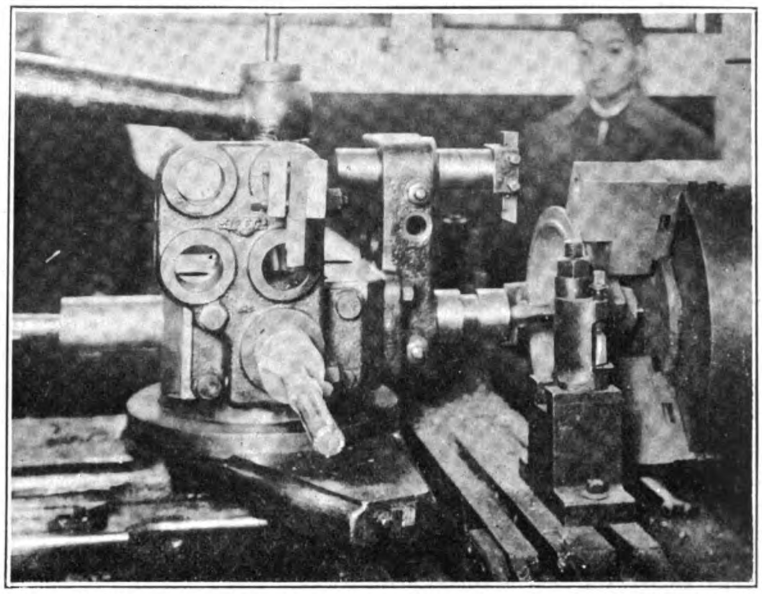


Fig. 4. Close up view of same machine, taken at the Machine Tool Exhibition at Osaka

slides on which are both front and rear positions. The front position is generally used for the roughing cuts and the rear cross slide for the finishing cuts. Knurling can be done either on the cross slide or turret as may be most convenient.

Of the bar working automatics used in Japan the Acme multiple spindle, Gridley multiple, and Gridley single spindle automatics are the best known. The multiple spindle machines are used for machining work made from bars of stock from $\frac{1}{16}$-in. up to 4½-in. in diameter, and the single spindle machines for work from 1-in. up to 5½-in. in diameter. The multiple spindle machines have become the most popular of the two classes. These machinse are used for making screws, bolts, nuts, punches, small spindles, safety razor handles, phonograph parts, fountain pens, bullets and a thousand and one other articles that are made direct from rods of iron, steel, brass, vulcanite, etc. These machines are so designed that they carry four bars of material and all cutting tools will work on the four bars at once. The time taken to complete any particular article is the time taken to complete the longest cut, plus the time taken for the machine to automatically index from one position to another, and to feed out the new length of material to be worked upon, and the time to do this is about two seconds or slightly longer according to the size of the machine. These machines as in the case of the chuck work automatics will perform any operation as may be required, and the closest limit of accuracy can be maintained on repetition work that would be inconceivable on hand operated machines.

Automatic machines are far more rigidly built than hand operated machines of like capacity, and this rigidity permits the use of faster speeds and feeds, without destroying the cutting edges of the tools as would be the case with the tools on the less rigid hand operated machines, for the lack of rigidity in the latter machines permits a slight chatter to take place when the tools are cutting and it is this chatter that is more detrimental to the sharp edges of the tools than the actual cutting action.

The Japanese and Manchurian Oil Industry

AT a recent meeting of the Union of German Chemists Mr. R. Ockel, of Bonn, read a paper upon the oil industry in Japan and Manchuria, from which the following details are extracted. The Japanese oil industry is, relatively speaking, small and not of much importance, but it is all the more important, in comparison, in Manchuria, which is occupied by the Japanese. This latter covers a superficial area of 456,000 English square miles, or about 2 per cent. times larger than Germany. The exports of soya beans, bean cake and oil have increased from 21,745,000 Haikuan taels in 1912 to 74,000,000 in 1918. The production in 1915 amounted to 108,782,216 bushels, or about 3,000,000 tons of beans, value Y.306,765,849. Of this total about three-quarters were exported, about 30 per cent. in the form of beans and the remainder in cake and oil; the beans went mostly to Japan and China, the oil cake to Japan, and the bean flour to Europe and America. In the Manchurian town of Dairen (formerly Dalny) in 1920 about 4,057 tons beans were pressed daily in sixty mills, yielding 386 tons oil and 3,717 tons cake. In August, 1921, the corresponding figures were 6,000 tons beans and 600 tons oil. At several oil mills at Dairen visited by the German chemist in question, the method of operation is precisely the same; the pre-heated beans, which look like small peas, are passed through a pair of rollers till they acquire the shape of small discs about the size of a farthing and 2 mm. thick ; of these, 29.6 kg. are weighed off and spread out upon sackcloth in a 5 cm. thick layer. This cloth is supported by an iron frame, and a nozzle placed below blows steam through it until the layer of bean discs is thoroughly steamed through, so that, even in cold weather (24° C.), such a tropical heat prevails in the chamber that the Chinese workmen do their work absolutely nude, and plunge from time to time into a bath of cold water let into the floor. The steamed beans are thrown into a wooden hoop or ring resting on two annular iron supports resting on a sheet of metal. In this wooden hoop there has first of all been placed a bundle, closed at one end, of a kind of straw-like rushes obtained at high prices from southern China. The warm beans are now stamped down with the bare feet, whilst at the same time the two iron annular supports are pulled upwards so that they encircle the cake with an intervening space of about 3 cm. The empty wooden hoop is now removed by one of the men, and the ends of the rushes are laid centrically over the cake ; this latter, with the bottom plate, is then pushed into the preliminary press, from which, when sufficiently compressed, it is transported by two men to the finishing press, where the cakes are laid one upon the other until the press is full, whereupon a pressure of at first 75 and then 150 atm. is applied, and the cakes left under this pressure for from five to six hours. When finished they are about 9 cm. thick and weigh 27.78 kg. About 9 per cent. oil is extracted; it is rendered impure by albumen in solution and 3 per cent. water is absorbed by the cake. At first some difficulty was encountered by Dr. Ockel in refining, due to the albumen in the oil, but these difficulties were subsequently overcome in the course of experiments made at the laboratory at Oimachi, near Tokio, and a very fine edible oil was obtained. In order to remove the albuminous sediment as far as possible, and obtain a uniform product, the South Manchurian Railway Co. erected at Dairen a large " mixed storage tank," into which the oil made in Dairen, as well as that produced throughout Manchuria, can be emptied from the casks ; from this tank it can be pumped, after traversing a long zigzag path, by means of electric or steam pumps at a speed of 50 tons per hour to the oil steamers through an 8-in. flexible pipe. Some filter presses have also been erected at the same place. The tank is made of iron ; at first a concrete reservoir was used, but the oil was found to be watery. The oil is filled into several cans at a time by an automatic ; filling device ; when soldered down two of these cans are packed in a case. Besides the three oil mills, Dairen also possesses an extraction plant capable of extracting 170 tons beans daily and securing 15 per cent. oil ; of this, 1 per cent. is emulsion, for which only half-price is obtained. 2 per cent. oil remains in the residue, whilst about 4 per cent. is lost with the condensation water and in soluble albumen ; this makes a total loss of about 7 per cent. The plant has sixteen extractors, each of three tons capacity. One of the three Dairen oil mills visited hardened their entire production of ten tons. The hydrogen is produced by the filter press process. In Kobe (Japan) there is also a hardening plant, but in Japan fish oil is hardened mostly without any prior refining. At Wakamatsu there is also a bean-extracting plant; it extracts 400 tons oil monthly and secures 15 per cent. oil from the beans. American cottonseed oil presses are used there. The refined oil contains about ½ per cent. fatty acid ; 2 per cent. oil is lost by neutralisation, and the preliminary deodorising is effected by drawing off the benzine with a vacuum pump ; the oil has a very bad taste. The greatest fault in the handling of the beans, whether by pressure or extraction, in Japan and Manchuria lies in the fact that the residue is used chiefly as a manure and also as a cattle food for the cattle bred for foreigners, as the Japanese do not eat meat or drink milk, living solely on rice, fruit, vegetables and tea. Fat, oil and butter are never eaten. Soya beans are eaten three times daily, namely, as soup in the morning, and in the midday and evening as sauce and in the form of a paste called " Chiang," which is also largely eaten by the Chinese. A kind of custard is also made from it in conjunction with bean albumen ; hence, if the beans were as carefully prepared as the cocoa bean, a pressed cake could easily be made of high nutritive value for human consumption, as it contains 45 per cent. albumen, i.e., 2½ times more than is contained in meat. The Japanese have now recognized this fact, and still greater attention is being given to the soya bean as an article of food for starving Europe.

Associated American Chambers of Commerce in China Formed

REPRESENTATIVES of American chamber of commerce located at Shanghai, Tientsin, Peking and Hankow held a meeting in the rooms of the American chamber at Shanghai on October 23 and formed an association representing all American commercial interests in China to be known as the Associated American Chambers of Commerce in China. The delegates to the meeting were: F. J. Twogood, representing Hankow; F. S. Williams and T. E. Simmang representing Tientsin; C. E. Seymour representing Peking and J. Harold Dollar, W. A. Burns V. G. Lyman, J. S. Dolan, A. B. Hykes H. B. Lane and C. B. Arthur representing Shanghai. The board of directors of the American chamber at Shanghai and Lansing W. Hoyt, U. S. trade commissioner, met with the delegates by invitation.

Purpose of Organization

The purpose of the associated American chamber as set forth in the constitution is to consider questions concerning American financial, commercial, manufacturing and shipping interests in China; to communicate through the association the opinion of the American chambers of commerce and affiliated bodies to the American government; to attain by united action such advantages as individual chambers would have difficulty in obtaining separately; and when desirable; to appoint an agent or establish an office in Washington to insure to various members early and reliable information on matters affecting American interests and to facilitate communication between the associated chambers and the American government and public bodies in the United States.

After the adoption of the constitution the meeting considered a number of matters of vital import to American financial, commercial and general interests in China. Among the subjects discussed which later were the subject of resolutions, are: American investments in China; China and world financial readjustment; China's defaults upon American loans and other governmental obligations; the special tariff conference; co-operation with an American protective Committee that has been organized in Peking; the China trade act; American consular, diplomatic and commercial attaché services in China; harbor improvements and regulations for Shanghai, Tientsin, Canton, Tsingtao and other ports; American consular property in China; American personnel in Chinese government services; postage rates between China and the United States; disorder in China; depreciated copper currency; exchange of news between America and China; American Yangtze river patrol; application of rule one of the Chinese customs duties and the imposition of illegal and burdensome surtaxes and other restrictions on trade by the Chinese governmental and provincial officials.

Mr. J. HAROLD DOLLAR
President, American Chamber of Commerce of Shanghai

Hoover's Investigation Committee

Although the resolutions adopted have not yet been drafted in form for publication and circulation to the members the subject of American investments in China and other financial matters received considerable attention. Gratitude was expressed at the appointment of a financial investigation committee by Secretary Hoover a few days ago and the associated chambers voted to give this committee full co-operation in making investigations and in carrying out its work to the end that American investments in China may be protected and placed on an even footing with those of other nationals. On the subject of China and world financial readjustment it was the sense of the meeting that, in case the United States called a general financial and economic conference for the purpose of readjusting European and world finance, China be included in such a conference and that the status of China be considered as a part of any scheme for world financial rehabilitation.

Considerable attention was paid to the special tariff conference which is expected to meet in Peking next spring and a resolution passed urged upon President Harding the importance of appointing "the strongest possible commission from the stand-point of personnel and technical skill, men with a thorough knowledge of China's treaties and commitments, to the end that American interests in China may be protected, the open door fully maintained, and American investment and obligations in China be placed on an absolutely equal footing with those of other nationals." The association took a strong stand on the subject of China's defaults upon American loans and government debts for equipment purchased and passed a resolution depreciating the effect of these defaults upon American trade and China's credit in the United States. The American government was urged to take the necessary steps to see that American interests in this regard be not discriminated against.

Several of the matters discussed were of interest outside of the commercial community, especially one dealing with the need for fuller and better American news reports in China. The American government was urged to take action extending to China the present low wireless rates for news messages now in existence between America and the Philippine Islands. Another action recommend the immediate negotiation of a reciprocal postal treaty between China and the United States whereby domestic postage rates may be made to apply similar to a treaty now in existence between China and Japan and between America and Great Britain.

Japanese Electrical Notes

KUMAMOTO ELECTRIC TRAMWAY.—On May 16, 1922, the Kumamoto Densha K.K., organized in November, 1921, with a capital of Y.3,000,000 was registered. The object of this company is to construct an electric railway within and around the city of Kumamoto, and to engage in freight and passenger transportation. The main office of the company is at 46 Kenya Ima Machi, Kumamoto city.

SAKU SUWA ELECTRIC TRAMWAY.—On May 10, 1922, the Saku Suwa Denki Tetsudo K.K. was established with the object of constructing an electric railway and engaging in transportation in Nagano prefecture. The capital is Y.5,000,000, of which one-tenth is paid up. Its main office is 2,360 Kyowa Mura, Kita Saku Gun Nagano prefecture.

TOSA ELECTRIC TRAMWAY.—The Tosa Denki Tetsudo K.K., recently licensed, and the Tosa Suiryoku Denki K.K., have agreed to amalgamate. The new company will be capitalized at Y.6,000,000 ; the president is Mr. Tomoshiro Uda.

GUNMA ELECTRIC CO.—The Kanai power plant of the Gunma Denryoku K. K., under construction on the Agatsuma branch of the Tone Gawa, and the transmission lines to the Kawasaki transformer station in Kanagawa prefecture are almost completed. This new plant will generate 10,800 kilowatts at ordinary stages of water, and 7,800 kilowatts when the water is low. The Keihan Denki Tetsudo K. K., the Fuji Gasu Boseki K. K., and the Japan Steel Works, Ltd., have contracted for the power. It is also reported that the Gunma Company has decided to purchase the light and power business of the Keihan Denki Tetsudo K. K. at a cost of Y.5,500,000.

HIROSHIMA GAS AND ELECTRIC RAILWAY CO., LTD.—Capitalized at Y.10,000,000 and the Otagawa Hydro Electric Co., Ltd., have decided to amalgamate under the name of the Hiroshima Denki Tetsudo Gasu K. K. (Hiroshima Electric Railway and Gas Co. Ltd.)

NEW HYDRO-ELECTRIC ENTERPRISE.—Kinkichi Muto and several others plan to construct a 5,500 kilowatt power plant on the upper stream of the Agatsuma branch of the Tone Gawa, with a capital of Y.2,000,000. The cost of constructing the power plant is estimated at Y.2,800,000, the work to be finished by the end of 1923. When completed, a second plant to generate 10,000 kilowatts will be constructed at an estimated cost of Y.4,370,000, on the same river. Preparations for work are under way. The power generated by these plants will be sold to the Tokyo Electric Light Co., Ltd.

CAPITAL INCREASE OF ELECTRIC COMPANIES.—Chichibu Tetsudo K. K. (Saitama prefecture) registered increase to Y.3,000,000 ($\frac{1}{10}$ paid up) on May 27, 1922.

Ehime Suiryoku Denki K. K. registered on May 23, 1922 to Y.3,000,000 ($\frac{1}{4}$ paid up).

Ihigawa Denki K. K. (Gifu prefecture) to Y.8,500,000 (all paid up) by Y.1,500,000 as a result of the amalgamation with the Yoro Tetsudo Kabushiki Kaisha. The capital increase was registered on July 1, 1922.

Hokkaido Denki Tetsudo (Hokkaido) registered on July 6, 1922 to Y.5,000,000 ($\frac{1}{10}$ paid up).

Sobu Denryoku K. K. (Kanagawa prefecture) registered on May 27, 1922, to Y.4,850,000 ($\frac{1}{4}$ paid up) as a result of amalgamation with the Zushi Dento K. K.

Kumamoto Denki K. K. (Kuamoto prefecture) registered on May 18, 1922, to Y.13,000,000 ($\frac{1}{4}$ paid up) as the result of Midorikawa Denryoku K. K.

Samekawa Denryoku K. K. (Tokyo prefecture) to Y.2,000,000 ; registered, June 27, 1922. Keihan Denki Tetsudo K. K. (Osaka prefecture), registered on August 5, 1922, to Y.11,520,000 (all paid) as a result of amalgamation with the Wakayama Suiryoku Denki K. K. on July 24, 1922.

Nagoya Tetsudo (Aichi prefecture) was licensed on August 19, 1922, to extend the electric of the company, gauge 3-ft. 6-in., between Biwajima-machi, Kasugai-gun, Aichi prefecture, and Sasajima-machi, Nak Ku, Nagoya city, Aichi prefecture, a distance of 1 mile 70 chains. The cost of construction is estimated at Y.1,300,000.

THE TOMI-IWA TETSUDO (Toyama prefecture) was licensed on September 2, 1922, to construct an electric railway with a gauge of 3-ft. 6in. between Ushijima, Toyama city, Toyama prefecture, and Higashi Iwase-machi, Shinkawa-gun, Toyama prefecture, a distance of 4 miles 10 chains. The estimated cost of construction is Y.600,000, chief promoter Kinjiro, Kato.

Osaka Electric Light Co.: of the two power plants at Kasugade of this company, each 25,000 kw., one has been completed and opened to business at the beginning of September, 1922.

Yahagi Hydro-Electric Company : of Aichi prefecture, has completed a new 2,800 kw. plant at Oshiyama, which will transmit power over the lines of the Daido Denryoku K. K., to the Tohoku Denryoku K. K.

In order to complete this plant the unpaid portion of Y.10,000 on the Yahagi shares have been called up. The total capital is now Y.5,750,000, and there is Y.1,500,000 of loans outstanding.

This gives the Yahagi Suiryoku K. K., a total power capacity of 15,800 kilowatts. The president of the company is T. Inouye ; managing director, E. Sugiyama.

UJIGAWA ELECTRIC COMPANY.—On June 26, 1922, at an extraordinary meeting of the shareholders of the Ujigawa Electric Company held in Osaka, the following measures were approved :—

(1) Merger with Kumano Denki K. K., approved and a capital increase of Y.1,050,000 authorized to cover the purchase. (2) Merger with Taisho Suiryoku Denki K. K., approved and a capital increase of Y.2,666,650 authorized to complete the transaction.

In addition, it was decided to increase the outstanding capital by Y.43,633,350 in order to complete the construction plans now approved. As a result, the total capital of the Ujigawa Denki K. K. is raised to Y.85,000,000. The number of shares issued amounts to 1,700,000.

NEW POWER PLANT, OSAKA.—The electric railway bureau of the Osaka municipality owns the No. 2 a power plant, at Kujo in Osaka city. In August, 1921, construction was commenced on a new plant, the building for which was completed in April, 1922, at a cost of Y.400,000. A canal is ow under construction at a cost of Y.290,000. Machinery consisting of 15 boilers and two generators with a capacity of 10,000 kilowatts each is being installed. Both generators will be in operation this year. At present, 9,000 kilowatts are ready for use but will be held in reserve of the regular supply. Of the 20,000 kilowatts which will be generated on completion of this plant, 10,000 will be used to operate the city electric car lines, 2,000-3,000 kilowatts taken by the Shibashima Water Works Intake, and the balance sold to private consumers.

WAKAYAMA HYDRO-ELECTRIC POWER PLANT.—Because of the lack of water in winter, the supply of power in Wakayama prefecture is materially decreased each year to the injury of industries using electric motors. For instance, the Wakayama Suiryoku K. K., which recently combined with the Keihan Bentetsu K. K., stopped operations every other day last winter and the Kishu Flannel Manufacturing Co. was badly hit.

To remedy this situation, the prefectural government has determined to enter the field, and furnish power to the existing industrial concerns at cost. Prefectural finances however, are as yet inadequate to cover the cost of construction, so actual building operations are delayed.

The river Shingu, Hitaka, and Arita have been surveyed for sites. The upper stream of the Arita river at Otaki and Hanazono will be used for power, and construction of plants will be commenced in 1923, it is reported, plans are perfected and bids for work will shortly be entertained.

CABLE CARS FOR MT. FUJI.—Risaburo Kuki, a business man of Numadzu, has promoted a company called the Fuji Kaku Sakudo K. K., with a capital of Y.1,000,000, to build an electrically operated aerial cable line from the eighth station on Mt. Fuji, on the Gotemba Side (about 10,000 feet above sea level), to the summit of the mountain (12,365 feet), a total distance of 1.7 miles. The cost is estimated at Y.150,000. It is planned to open business next year.

KANSAI ELECTRIC COMPANY.—On June 26, 1922, at the general shareholders meeting of the Kansai Denki K. K., it was decided to purchase the Yamashiro Suiryoku Denki K. K., the Hokusei Denki K. K., the Aiki Denki Kogyo K. K., the Toki Suiryoku Denki K. K., the Kyushu Dento Tetsudo K. K., the Yawata Suiryoku Denki K. K., the Bishu Denki K. K., and the Nagoya Gas Company.

Profits for the first business term of 1922 were Y.6,896,307, of which Y.500,000 was set aside for redemption of loans. Surplus carried forward from the previous term amounted to Y.91,373. A dividend at the rate of 13 per cent. per annum was allowed for the term leaving Y.98,698 to be carried forward as surplus to the next term of business.

Owing to the amalgamation of the Kyushu Denki Tetsudo K. K., the name Kansai Denki (the Kansai is the district around Osaka, Nagoya and Kobe), was no longer appropriate to the company. The name has accordingly been changed to To Ho Denryoku K. K., and the main office of the company transferred to Tokyo. Branch offices are to be maintained at Nagoya, Gifu, Nara, Yokkaichi, Shimonoseki, Fukuoka, Kurume, Omuta, Saga, Nagasaki and Saseho.

NEW ELECTRIC MACHINERY COMPANIES : YOSHIWADA SHOTEN, KABUSHIKI KAISHA.—Main Office. 4 Sojuro-machi, Kyobashi Ku, Tokyo city. Business : Sale and purchase of electric and other machinery. Contracting, manufacture of electrical supplies. Established : June 1, 1922 ; Capital : Y.300,000 ; Paid up : Y.75,000 ; Representative Director, J. Yoshiwada.

MATSUNO SHOTEN, KABUSHIKI KAISHA.—Main office : 5 Matsushita Cho, Kanda Ku, Tokyo City. Business : Chemical and surgical apparatus, manufacture and export. Manufacture and sale of drugs and general chemicals. Manufacture of glass, electrical machinery and supplies. Sale of meters. Established : June, 1922 ; Capital : Y.60,000, paid up : Y.24,000 ; Representative director, K. Wada.

Taika Kogu Kabushiki Kaisha (Taika Engineering Tools Co., Ltd.) Main office : 2 Kotohira Cho, Shiba Ku, Tokyo. Business : Machine tools, and electric machinery ; Manufacture and sale. Also to sell products of Taika Denki Yakin Koshi. Established : May 27, 1922 ; Capital : Y.100,000 all paid up. No. of shares : 4,000 ; Director, K. Uyeshima.

DAI NIHON DENKI K. K.—Main office : No. 28 Udagawa Machi, Shiba Ku, Tokyo City. Business : Supply of electric machines and material, Contractors for electric works ; Established : June 15, 1922 ; Capital : Y.50,000, paid up : Y. 12,500 : Rep. Director, T. Takei.

TAIWAN DENRYOKU K. K.—In 1921 the Taiwan Electric Power Co. planned to issue bonds to the value of Y.30,000,000, but only half of that amount was floated. The balance cannot be raised at this time because of the tight financial market. Part of the company's plans have therefore been abandoned, and work stopped. The initial construction plans will not be completed until 1925.

YAMAGUCHI PREFECTURAL ELECTRIC WORKS.—The Yamaguchi prefecture government is constructing a power plant on the Nishiki river. With low water, the power generated will be 1,194 and at ordinary stages, 3,356 kilowatts. The canal will be 4,152 *ken* (*ken* is 6 feet), of which, 3,957 *ken* will be tunnel work. The dam will be 69 feet high. The quantity of water will be 50 gallons per second at low stages, and at ordinary stages 152 gallons. The effective fall at low stages is 383 feet, at ordinary, 397 feet. The theoretical H.P. at low water is 2,130 H.P. at ordinary stages 5,982 H.P. The contract cost of construction is Y.182,000.

SHOKAWA SUIRYOKU KAISHA.—The Shokawa Hydro-Electric Co. has commenced work on a new power plant at Inami-machi, Toyama

prefecture, to generate 54,000 kilowatts. The company is capitalized at Y.10,000,000.

KUMAMOTO CITY WILL MUNICIPALIZE ELECTRIC LINES.—The Kumamoto Denki Kaisha has been operating electric tram lines in the city of Kumamoto, but in November last a new company called the Kumamoto Densha K. K., was established to construct tramways in the streets of that city. An understanding existed between these two companies and the authorities about municipalization, and on July 25 a purchase plan was approved by the city assembly, the principal terms of which are: (1) The city will take over the property of the companies as from June 30, 1922. (2) The city will deliver within six months city bonds for Y.750,000, bearing interest at 6 per cent. (3) The companies will buy Y.820,000 of city bonds bearing interest at 7 per cent.

OMUTA ELECTRIC TRAMWAY CO.—This company was planned, in 1917, with a capital of Y.280,000 but a license was not granted until June 24, 1922. On July 16, a meeting was held to establish the company.

The line to be built will connect Omuta city and Mikawa-machi, Miike-gun, Kumamoto prefecture, a distance of 2 miles and 42 chains, single track. After this line is finished, the capital will be increased to Y.3,000,000 and other lines will be built from Miike-machi to the Toda station of the imperial government railways. The officers of the company are: Managing Director, T. Masuda; Directors, K. Matsumoto, T. Tominaga, T. Yamaguchi and T. Nagami.

FUJI SUIRYOKU DENKI K. K.—The Fuji Suiryoku Denki K. K. at an extraordinary meeting of its shareholders on July 20, 1922, approved the purchase of the Sagami Denryoku K. K. Capital was increased to Y.34,860,000 from Y.33,860,000.

NEW LINE BETWEEN TOKYO AND YOKOHAMA.—A new company called the Tokai Kido K. K. (Tokai Tramway Co., Ltd.) has been organized with a capital of Y.20,000,000 to construct and operate a line between Tokyo city, Shiba Ku, Shibaguchi, and Yokohama city, Yoshida Bashi, Isesakicho, a distance of 18.3 miles. The line will run through city streets for three miles along national roads for 13 miles, and will build 2¼ miles of new roads for its right of way. This company has agreed to bear part of the expense of reconstructing the national road between Yokohama and Tokyo.

AZUMAGAWA DENRYOKU K. K.—A new electric power company to be capitalized at Y.8,000,000 and called the Azumagawa Denryoku K. K., has been promoted by Mr. T. Shirai, and other members of the staffs of the Tokyo Dento K. K. and the Katsuragawa Denryoku K. K. All the power will be sold by special contract to the Tokyo Dento. Of 160,000 shares, the Tokyo Dento will take 20,000. Power plants will be built on the Azumagawa, at Imai, Nishikubo, and at Haneo in Gunma prefecture. The canal will be 5,125 *ken* long and the fall 570 feet. About 26,447 H.P. will be generated.

EIHIJI TETSUDO K. K.—A license was issued to the Eiheiji Tetsudo K. K. on July 28, 1922, to construct an electric railway line between Shimo Shihi mura, Yoshida-gun, and Shibiya-mura, Yoshida-gun, in Fukui prefecture, a distance of 3 miles 26 chains. The cost of construction will be Y.350,000.

OSAKA KIDO K. K., NEW LINES.—The departments of railways and home affairs on July 28, 1922, approved a license to the Osaka Kido K. K., to build two new lines: (1) An electric line between Kuromoncho, Higashi Ku, Osaka city and Fuse-mura, Naka Kocki-gun, Osaka prefecture, (2) Extension of line from Tenma Bashi Suji, 4 chome, Kita Ku, Osaka city, to Koshae-mura, Naka Kocki-gun, Osaka prefecture.

ARIMA DENKI KIDO K. K.—On July 5, 1922, a license was granted to the Arima Denki Kido K. K., to construct a railway between Kawatsura, Obama-mura, Kawabe-gun, Hyogo prefecture, and Arima-machi, Arima-gun, Hyogo prefecture.

IZUMI DENKI KIDO K. K.—This company was licensed July 7, 1922, to build a line between Hamadera-machi and Sano-machi, Osaka perfecture. A new license was granted for a line between Hamadera-machi to Imamiya-machi, in the suburbs of Osaka city.

KONAN DENSHA KIDO K. K.—On July 7, 1922, a license was issued to the Konan Dansha Kido K. K., to construct an electric railway between Ashiwara-machi, Nanba, Minami Ku, Osaka city, and Tsukisu, Ebisu, Sakai city, Osaka prefecture.

IKOMA TOSAN KOSAKU TETSUDO K. K.—A license was granted on July 7, 1922, to the Ikoma Tosan Kosaku Tetsudo K. K., to construct an electrc railway line between Ishikiri, Oto-mura, Naka Kochi-gun, Osaka prefecture, and Tsujikogoe, Otom-mura, Naka Kochi-gun, Osaka prefecture, 1 mile 68 chains, gauge 3 feet 6 inches, at an estimate cost of construction of Y.400,000. The Osaka Kido is also operating in this district.

JOTO DENKI TETSUDO K. K.—On July 7, 1922 a license was grantpe to the Joto Denki Tetsudo K. K., to build an electric railway between Nakahon-machi, Tose-gun, Osaka prefecture and Oto-mura, Naka Kochi-gun, Osaka prefecture, 6 miles 35 chains, gauge 4 feet 8½ inches. The cost of construction is estimated at Y.1,500,000. This line will connect with the Ikoma Tosan Kosaku Tetsudo K. K.

TO USE CONCRETE POLES.—Because of typhoons, the Tokushima Suiryoku Denki K. K. has suffered much damage to its poles, and has been decided to substitute 50 feet steel concrete poles for all wooden poles now standing, at a cost of Y.500,000.

POWER FROM CITY REFUSE.—The Osaka sanitary bureau has conductad investigation into the burning of the city refuse for the purpose of producing electric power and gas. In the budget for 1923-24 items will be included covering the construction of two plants to handle these matters. Work will be commenced on the electric power plant, with a capacity of 1,500 kilowatts.

IZUMO DENKI MERGER.—The Izumo Denki K. K., on July 5, 1922, decided to purchase the properties of the Hamada Denki K. K., increasing its capital of Y.9,500,000, by Y.1,000,000 to cover the transaction. A short time ago this company purchased the Chugoku Denki K. K., and at the same time the Onsentsu Dento K. K., capitalized at Y.150,000, was also bought up. The mergers will take effect on September 1, 1922, and practically monopolizes the power supply in the Izumo district, of Shimane prefecture, in the hands of the Izumo Denki K. K.

NEW KYOTO-OSAKA RAILWAY.—The Keihan Denki Tetsudo K. K. (Osaka-Kyoto Electric Ry. Co., Ltd.) was recently authorized to construct a new line between Osaka and Kyoto. In order to separate the business of its present line and the new line, a subsidiary corporation, called the Shin (New) Keihan Denki Tetsudo K. K., capitalized at Y.25,000,000, was organized to construct and operate the new line.

On July 28, 1922, the officers of the company were elected, and work especially on the important section entering Osaka city, is to begin at once. The officers elected are: President, K. Okazaki; Managing Director, K. Ota; Directors, K. Watanable, T. Murai, N. Nagata, S. Inouye and S. Ono. Auditors, K. Hamaguchi, Y. Shimamura and S. Yuasa.

COMPANY'S RAILWAY LINES.—The Musashi Hydro-Electric Co. owns several steam and electric railways lines. In order to separate the business of transportation from that of power and light supply, a new company called the Musashi Tetsudo K. K. (Musashi Railway Co. Ltd.) has been promoted by Viscount Shibusawa.

The new company will purchase the transportation enterprises of the Musashi Hydro-Electric Power Co., which include 65 miles lines in operation and several lines licensed to be built. The new company will electrify all the lines. It is capitalized at Y.6,000,000 in 120,000 shares, half be taken by the promoters, the other half offered to the public.

TEIKOKU DENTO K. K.—The Teiko Electric Light Co., Ltd., has been very active of late in effecting amalgamations with smaller electric lighting concerns and its capital of Y.25,000,000 will be doubled.

Japanese steamers equipped with wireless, in July.

GYOKO MARU.—Owned by Yamashita Kisen Kaisha; Call J H Q A: Apparatus installed; Nippon Radio Co., momentary spark type.

TOKO MARU.—Same owner; Call J H. R. A; Apparatus; same.

HOKKO MARU.—Same owner; Call; J H W A; Apparatus, Dept. of Communications, quenched spark type.

MOJI MARU.—Owned by Nippon Yusen Kaisha; Call J. I R A; Apparatue Installed; Dept. of Communications, quenched spark type.

KAIKO MARU.—Owned by I. Kuzuhara, Call; J H S A; Apparatus Installed; Nippon Radio Co., momentary spark type.

HAYATORI MARU.—Owned by Department of Agriculture and Commerce; Call J H Y; Apparatus; Dept. of Communications, ordinary spark type.

KYOSEI MARU.—Owned by Kyosei Kisen K. K., Call J H T A; Apparatus Installed; Dept. of Communications, quenched spark type.

EIKO MARU.—Owned by Nippon Yusen Kaisha; Call J H U A; Apparatus; Dept. of Communications; quenched spark type.

AWAJI MARU.—Same owner; Call J H V A; Apparatus; same.

MENADO MARU.—Owned by Osaka Shosen Kaisha; Call J H X A; Apparatus installed; Dept. of Communications; quenched spark type.

CHOSA MARU.—Owner Same; Call J H Y A; Apparatus; same.

ELECTRIC MERGER.—The Iwaki Denki K. K., of Komogome, Higashi Katamachi, 137 Hongo Ku, Tokyo city, operating an electro-chemical plant in Fukushima prefecture, will amalgamate with the Itoyo Suiryoku Denki K. K., whose main office is at 146 Yahata, Itoyo-mura, Tamura-gun, Fukushima prefecture.

ELECTRIC FANS IN TOKYO, 1922.—The Tokyo Electric Light Co. states that on July 10, 1922, it was furnishing power for 45,000 electric fans in the city of Tokyo. Compared to 1921 this is an increase of 20 per cent. More than 99 per cent. of the fans are 12 inch types. The electric bureau of the Tokyo municipality, according to an investigation of July 10, 1922, supplied power to 4,668 fans in 4,241 homes. These were also mainly of the 12-inch types.

TAMAGAWA TO BE EXPLOITED.—The water power of the upper Tama near Tokyo has for a long time been the object of much competition between rival power interests. A license has been granted a private company, promoted, it is said, by twenty conflicting power interests. A company capitalized at about Y.10,000,000 is now being actively advertised. At low water the head in this river is from 200 to 250 gallons a second, and 10,000 H.P. can be generated.

NEW HYDRO-ELECTRIC PLANT.—The Kanto Suiden K. K. plans building a power plant on the shore of lake Ose in Fukushima prefecture. From this lake the Tadami river takes its rise, and flows through Fukushima prefecture. The lake is bordered by deep forests, and is little visited.

The plan is to build a reservoir from which the water will fall 3,000 feet to the generating station. Such a fall is a rarity in Japan, and 45,000 H.P., can be generated at this new plant.

ATMOSPHERIC NITROGEN PLANT.—The Suzuki Shoten, of Kobe, will erect an atmospheric nitrogen fixing plant at Hikoshima in the suburbs of Shimonoseki. The survey of the site has been completed, but the plans are kept in the most profound secret. It is reported, however, that the plant will produce ten tons of nitrogen a day, and 1,000 tons of fertilizers. The plant will be of the French type.

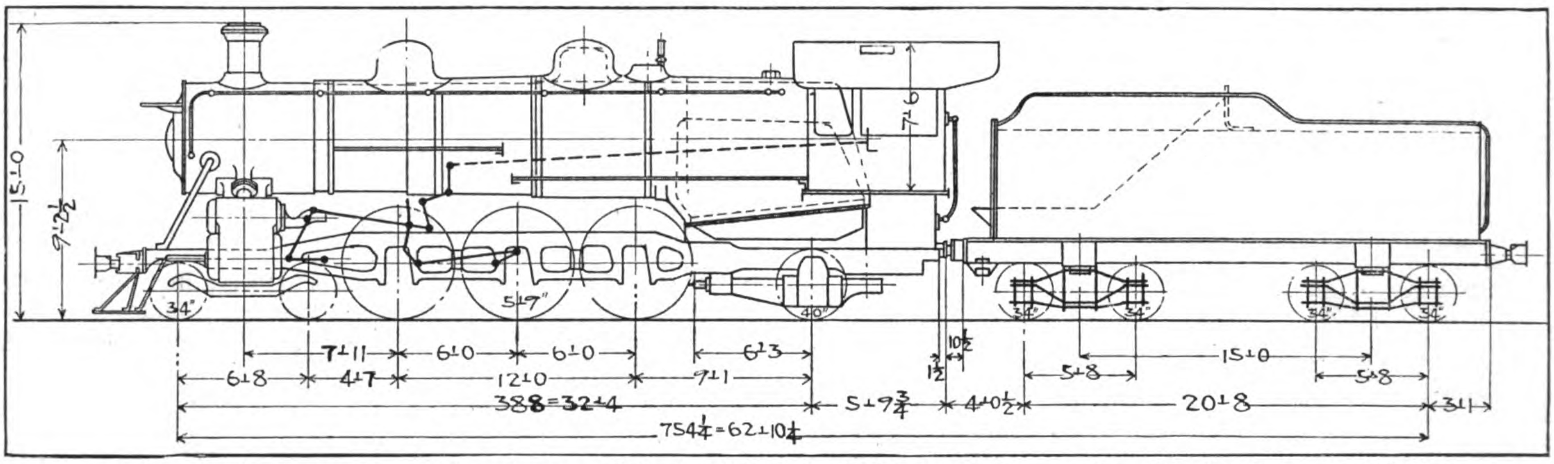
YOKOHAMA ELECTRIC RAILWAYS EXTENDED.—The Yokohama municipal electric bureau will commence construction on the third part of its track extension program. A loan of Y.3,950,000 has been approved to cover the costs.

ELECTRIC TRAMWAY MERGER.—The city of Nagano, and the town of Yoshida in Nagano prefecture, will combine their plans for the construction of an electric railway between the two places, to be later extended from Yoshida to Sasaka. The line will cost Y.250,000 and is to be completed by July 1923.

Japanese Locomotives for Chinese Railways

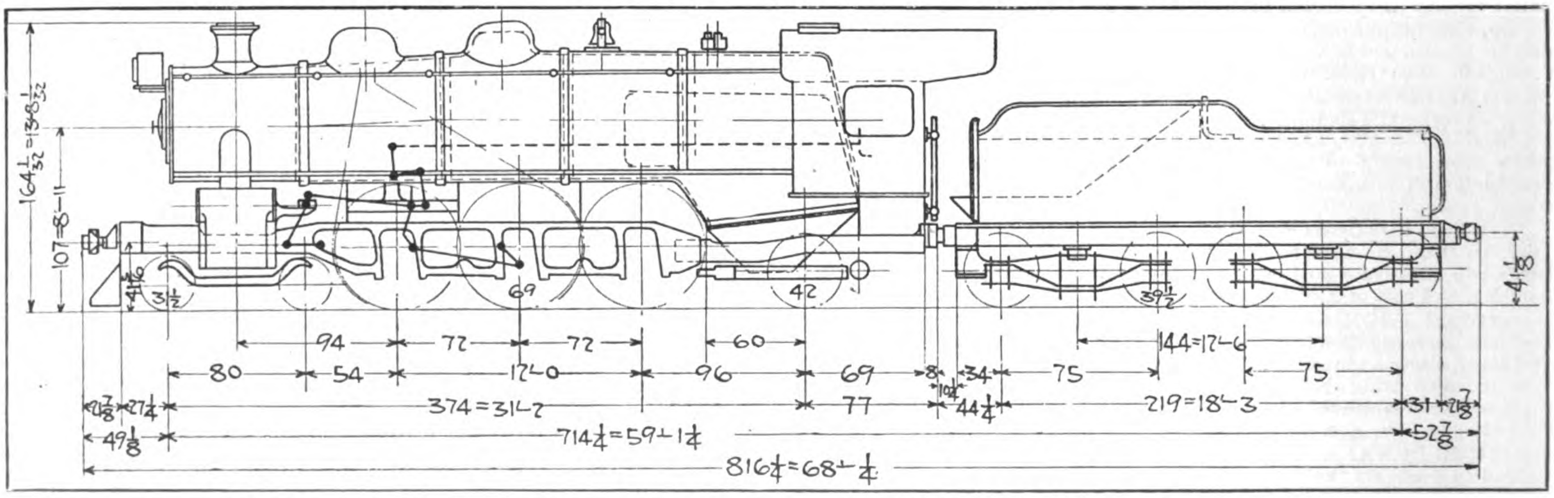
ONE of the first orders for standard gauge locomotives for service on Chinese railways placed with Japanese manufacturers was secured by theKisha Seizo Kaisha of Osaka. This company was entrusted with building two of the 4-6-2 type of tender locomotives recently ordered by the Shantung railway administration in addition to a further order from the South Manchuria Railway for its Chosen lines. The Kawasaki Dockyard also received orders for several of the same type of locomotive. The Kisha Seizo Kaisha has specialized in the manufacture of locomotives since its organization and with the extension of its plant during the war it has devoted more and more attention to the possibilities of the export market in Eastern Asia, and is now prepared to construct standard gauge rolling stock.

Foreign engineers who have inspected the works and its products frankly state that these not only compare favorably with locomotives made in Europe and America, but in some particulars they possess distinct advantages. Many of the finest and most powerful engines in operation on the imperial government railways have been turned out at the Osaka works of this company. In addition, passenger and freight cars of all types and sizes are manufactured for the domestic narrow gauge railways and electric tramways, while standard gauge cars have been built for the



4-6-2 Type Tender Locomotive with Superheater made by the Kisha Seize Kaisha for the Chosen Lines of the South ManchuriaıRailway

			Working Order	Empty
Gauge of Track	4′ 8½″	Weight on Leading Truck ...	43,500	
Dia. of Cylinder by Stroke	24″ × 26″	„ „ Trailing Truck ...	40,000	
Working Pressure	180 lb/sq. in.	„ „ 1st Driving wheel	„	
Grate Area	46.9 sq. ft.	„ „ 2nd „	„	
Total Heating Surface...	3,055 „ „	„ „ 3rd „	„	
Super „ „	600 „ „	Total Weight on „	120,000	
Evaporative Heating Surface Total ...	2,455 „ „	„ „ of Engine ...	203,500	184,000
„ Tube	2,262 „ „	Weight on 1st Tender wheel	31,500	
„ Fire Box	165 „ „	„ „ 2nd „ ...	„	
Arch Tube	28 „ „	„ „ 3rd „ ...	„	
Dia. of Boiler (out of 1st Ring) ...	5′ 6″	„ „ 4th „ ...	„	
Large Smoke Tube (Dia. Leng. × No.)	5⅜″ × 18′ 2 × 26	Total Weight of Tender	126,000	48,000
Small Smoke Tube (Dia. Leng. × No.)	2″ × 18′ 2″ × 168	„ „ Engine & Tender	329,500	
Boiler Water		Maximum Width	10′ 6″	
Capacity of Tank	800 cub. ft.	Tractive Power $= \frac{^{1}85 \text{ Pd. } ^{2} \text{S}}{\text{D}} =$	332,000-lbs.	
Fuel Carried	280,000-lbs.			



4-6-2 Type Tender Locomotive with Superheater for the Shantung Railway, made by the Kisha Seizo Kaisha

Korean and Manchurian lines. The shops are equipped to make cars for any gauge of line.

The powerful locomotives built by the Osaka works employed on the Abt railway over the Usui pass of the Shin-Yetsu line of the government railways, have called forth unstinted praise and admiration from engineering circles.

The annual manufacturing capacity of the Osaka works is 120 locomotives, 1,500 steel freight cars, 8,000 tons of bridge beams, 250 various machine tools and about 10,000 h.p. of the Takuma water tube boilers. The capacity of the Tokyo Works is 250 bogie passenger coaches, 2,500 freight cars and 1,000 switch stands. In addition to the Honju works a Tokyo, the company operates another branch works in Tokyo at Higashi Hirai-machi,· in Fukagawaku.

			Working Order	Empty
Gauge of Track	4' 8½"	Weight on Leading Truck ...	40,000-lbs.	lb.
Dia. of Cylinder by Stroke ...	20" × 26"	„ „ Trailing Truck ...	35,000 „	„
Working Pressure	200 lb/sq. in.	„ „ 1st Driving wheel	35,000 „	„
Grate Area	38.2 sq. ft.	„ „ 2nd „ ...	35,000 „	„
Total Heating Surface...	2,232 „	„ „ 3rd „ ...	35,000 „	„
Super „ „	470 „	Total Weight on „ ...	105,000 „	„
Evaporative Heating Surface Total...	1,762 „	„ „ of Engine ...	180.000 „	163,000 „
„ Tube	1,582 „	Weight on 1st Tender wheel	„	„
„ Fire Box	180 „	„ „ 2nd „ ...	„	„
Dia. of Boiler (out of 1st Ring) ...	5' 3$\frac{3}{16}$"	„ „ 3rd „ ...	„	„
Large Smoke Tube (Dia. Leng. × No.)	5⅝" × 16' 0 × 22	„ „ 4th „ ...	„	„
Small Smoke Tube (Dia. Leng. × No.)	2" × 16' "0 × 130	Total Weight of Tender ...	105,000 „	474,000 „
Boiler Water	270 cub. ft.	„ „ Engine & Tender	285,000 „	210,400 „
Capacity of Tank	680 „	Tractive Power = $\frac{^{1}85 \text{ Pd.}^{2} \text{ S}}{D}$ =	256,000-lbs.	
Fuel Carried	160,000-lbs.			

First Jap Warship With Electric Drive Stands Sea Trial

General Electric Company Equipped "Kamoi" Which Sails for Japan Soon

THE first vessel of any navy other than that of the United States to be equipped with the electric drive, the Japanese fuel ship *Kamoi* was pronounced recently by representatives of the Japanese imperial navy and by electrical men to have successfully stood the tests applied during the builders' sea trials on Thursday off the Delaware capes.

The *Kamoi* was at sea for 36 hours on this trial, during which time she was put through tests that brought into play every possible stress on all parts of her machinery and equipment. She was manned by a crew of the New York Shipbuilding corporation in addition to a Japanese crew commanded by Capt. T. Murase. The Japanese naval officers, including Capt. K. Goto, chief inspector in the United States for the Japanese imperial navy, were much pleased with the way the *Kamoi* came through her trial.

The *Kamoi* is a 20,000 ton, 8,000 horse-power twin-screw fuel ship, built in this country rather than in Japan so that she could be equipped with the electric drive, which has been highly developed in the United States. Her electrical facilities, which were designed and installed by the General Electrical Company, includes the use of synchronous motors for the first time with any twin-screw ship.

The main propulsion unit is an 8,000 horse-power Curtis turbine generator, which supplies current to two 4,000 horse-power synchronous motors, directly driving the twin-screw propellers. The excitation current is supplied by two 400-kilowatt direct-current turbine generators, and these also furnish power for the electrical auxiliaries of the ship. The latter include the main circulation pump, main condensation pump, sanitary pump, blower motors, steering gear, radio apparatus, ventilators and light-lighting circuit. As a reserve equipment, a 625 kilowatt auxiliary alternator which can be connected to either of the auxiliary turbines in case of the failure of the main driving unit, has been installed.

The radio equipment, also of General Electric make, comprises a one kilowatt telephone and telegraph transmitter and two complete receiving sets. One of the latter has a range of 250 to 3,000 metres and the other a range of 250 to 30,000 metres.

The normal tonnage of the ship is 19,500, she is 480-ft. long and has a beam of 62-ft. Her draft is 28-ft., and deadweight displacement, 13,000 tons. She is a coal burner, equipped with four Yarrow type boilers.

Tokio Will Sell Bonds To Build New Subways

A series of bonds issues to be floated as the work progresses will finance the new Tokio, Japan, subway, which it is estimated will cost 189,000,000 yen, or about $90,000,000. The American Express Company Securities, which announced the plans for construction some time ago, declares that construction will be begun within a few months. The new subway will extend the length of the city from south to north, with a line crossing at right angles from the city's eastern to its western limits. Tokio has a population of more than 2,500,000 and covers an area approximately the same as that of Paris.

In view of the fact that it is expected that much American equipment will be used in the construction of the subway it is not unlikely that the bonds will be sold there to finance its purchase.

Chinese Develop Palm Fiber Trade With United States

A considerable trade has developed in what is known as "palm fiber" in Hongkong with the United States for the manufacture of brushes. The material is the leaf stem of a small palm which grows wild over much of the South China hill country, and which is generally cultivated in some districts for its leaves—the common palm leaf fan of commerce.

The fiber is obtained simply by soaking the stem and stripping off the outside. The fiber in the stem is then cut into convenient lengths and shipped in bundles of about 200 pounds each. The fiber is used all over South China, in the manufacture of what are popularly known as "bamboo brooms," and for Chinese scrubbing brushes and similar articles.

150,100,000 Bushels of Wheat is Australia's yearly Contribution to the World's Harvesting at Darling Downs, town of Allora in distance

The Commonwealth of Australia

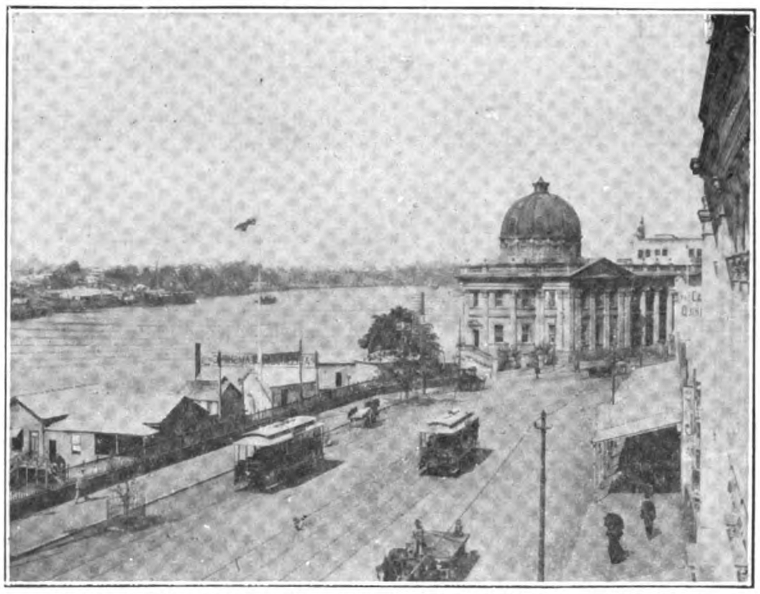
The Unique Continent—The Land of Commercial Opportunity

By Thos. J. McMahon, F.R.G.S.

AUSTRALIA is the most recent, the most isolated of the continents, it is the most remote from the centre of the world's activities. The commercial life of Australia is little more than seventy years. The great island continent of three million square miles, with its scanty population of five and half millions, is 2,500 miles from China, 3,000 from Japan. The nearest commercial neighbor, outside the British empire, is the rich island of Java, one thousand miles distant.

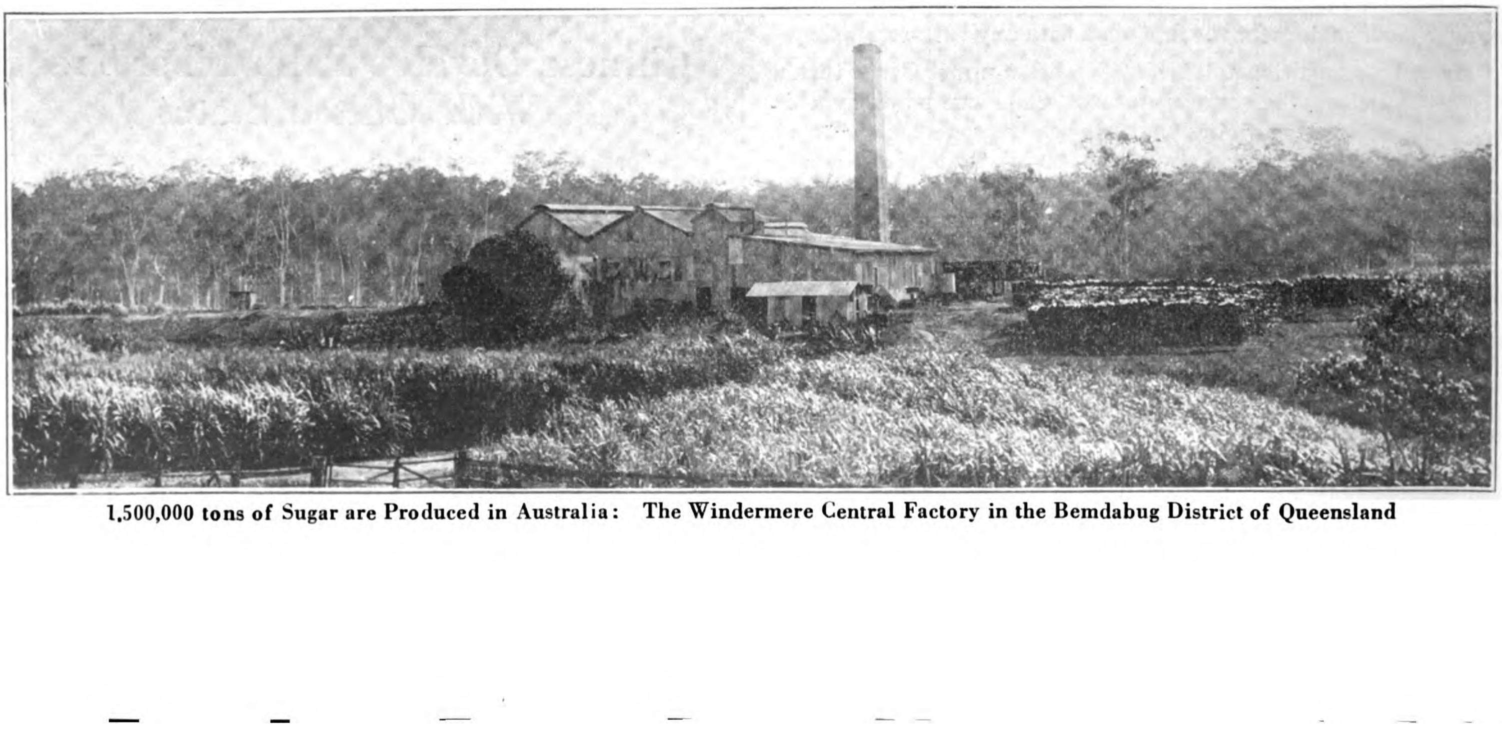
The Commonwealth is divided into six states, in population and importance they follow thus: New South Wales, Victoria, Queensland, South Australia, West Australia and Tasmania. The size of Australia can be gaged that the whole of Europe, including European Russia, can fit into it with ease and that it is capable of maintaining adequately at least 100 millions.

The history of Australia begins with the year 1788, when white settlement was begun in New South Wales. Settlement, however, quickly spread, and in the last seventy years the commercial progress has accomplished the following interesting details:—The total value of production is over £300,000,000 a year. There are 25,000 miles of railways, and hundreds of miles in construction. Australia is the greatest wool-producing country in the world with its flocks numbering 80,000,000. Cattle of the purest breeds amount to 20,000,000. In dairy produce, the export of butter, milk and cheese has a value of nearly £50,000,000. Australia cultivates 1,500,000 tons of sugar, and 150,000,000 bushels of wheat annually. Australia with its wonderful and varied resources has the promise of being in another 100 years the world's hive of commercial energy and enterprise.



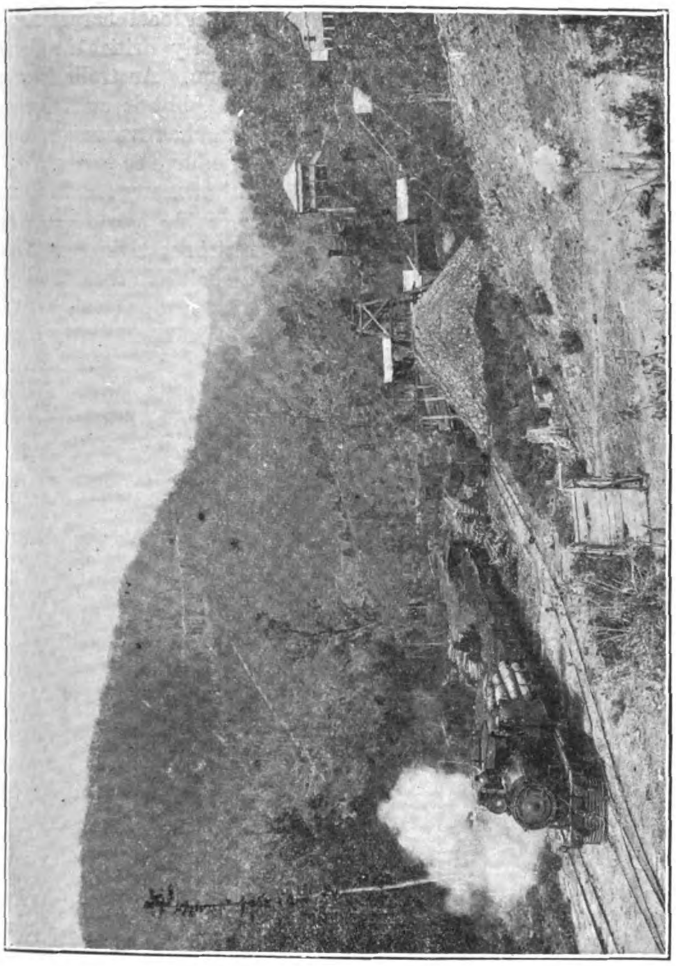
Petries Bight, showing the Custom House and River at Brisbane

The formation of Australia is likened to a tea cup saucer, the coastlands mountainous, and the interior vast. The great central lands now described as a desert, but recent exploration proclaims that one day the desert will smile with the verdure of wheat fields. Mount

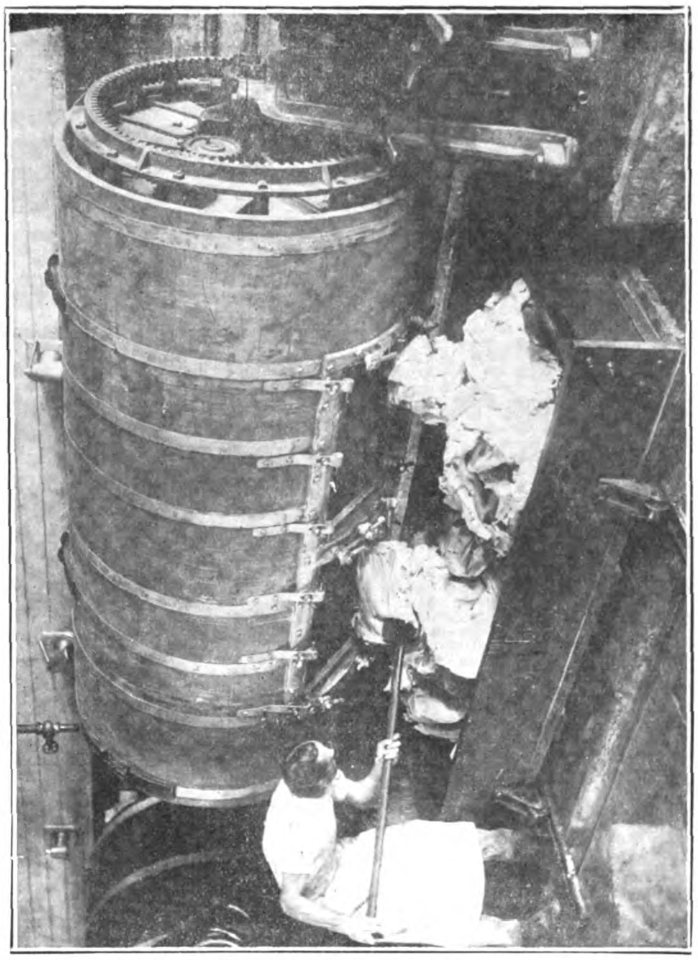


1,500,000 tons of Sugar are Produced in Australia: The Windermere Central Factory in the Bemdabug District of Queensland

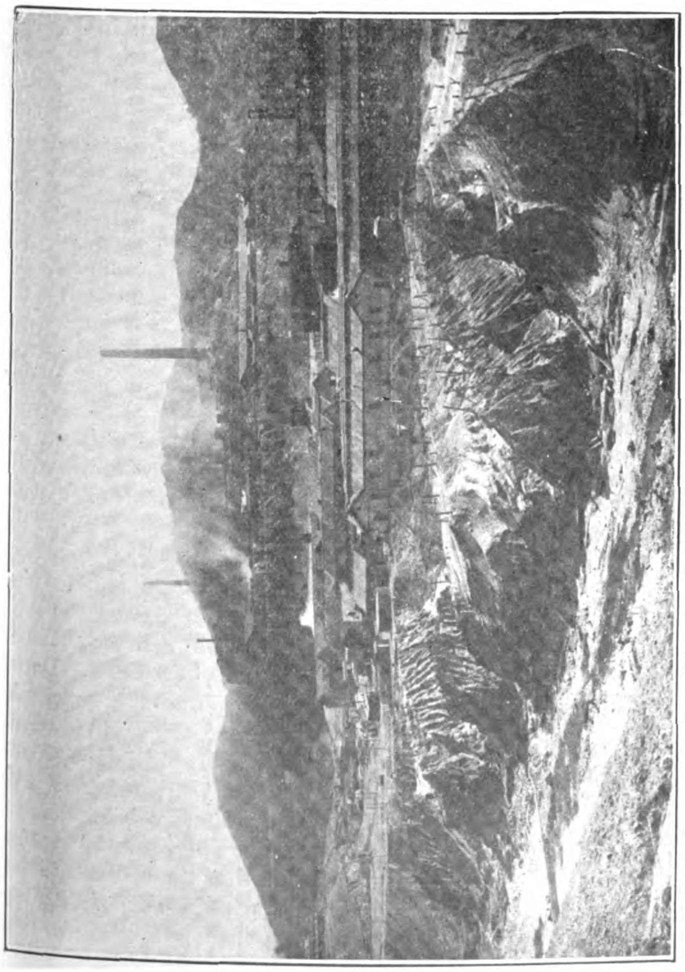
THE WEALTH OF AUSTRALIA



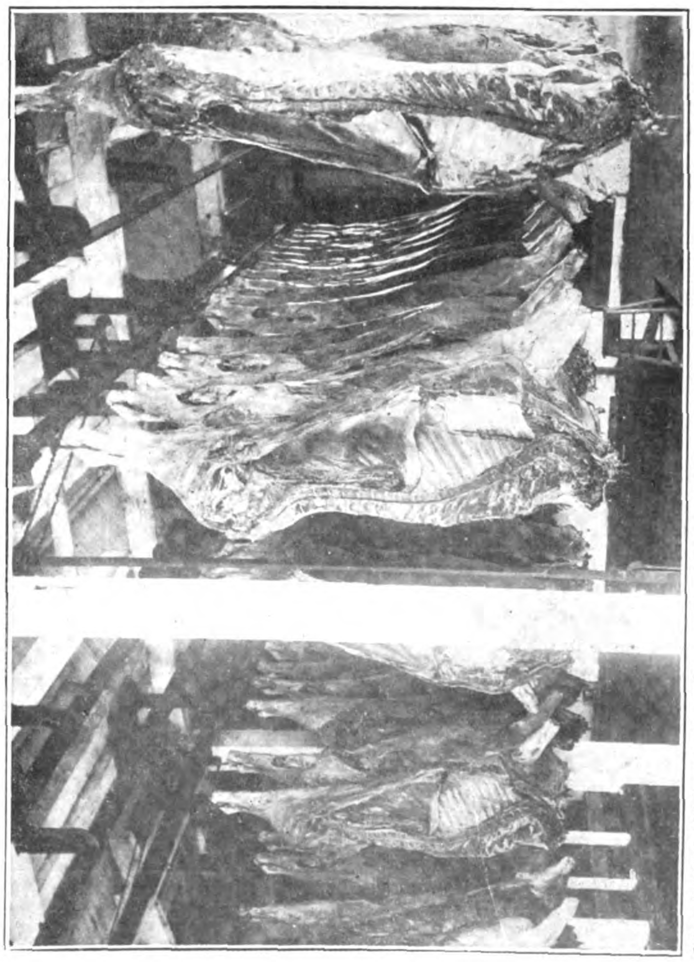
Colliery at Tannymorel, near Warwick, Queensland



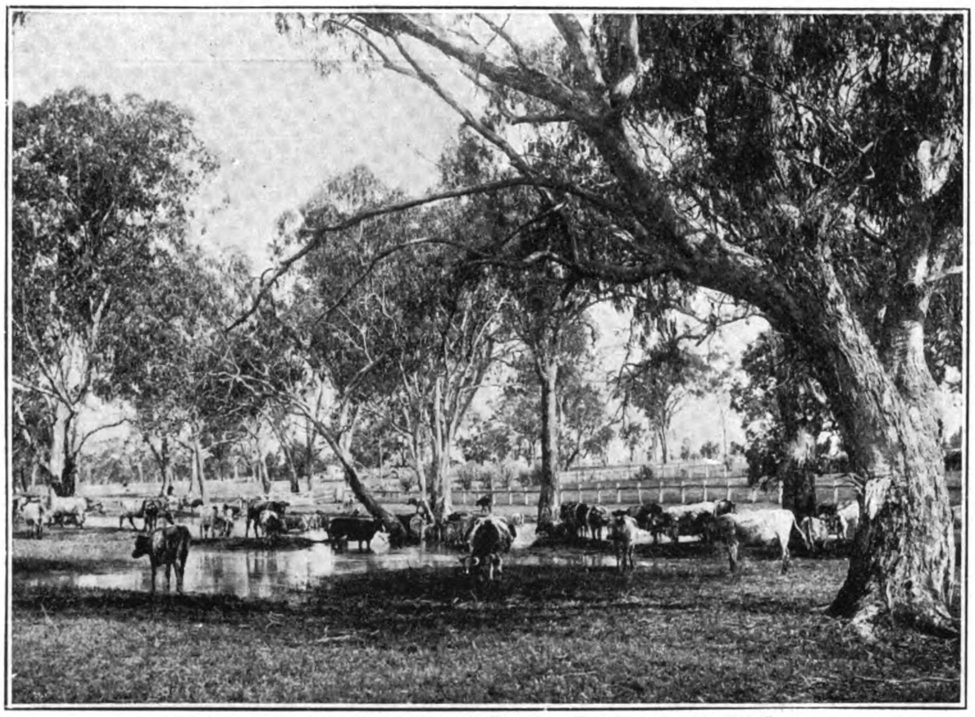
£50,000,000 of Dairy Produce is Exported from Australia: Interior View of the Kingston Butter Factory, near Brisbane



The Mount Morgan Gold and Copper Mine near Rockhampton, North Queensland



15 to 20,000,000 head of cattle permits Australia to export large quantities of prime beef; Beef for Export in the Cold Storage Warehouse of the Queensland Meat Export Co. at Brisbane



Dairy Farm at West Talgai, Darling Downs, Queensland

Kosciusko, 7,328 feet, is the continent's highest peak. Australia has many rivers and waterways, but few of any length, depth and of permanent water. Inland rivers are usually great wide, shallow, sand beds with trickling streams, but which in the rainy season swell into great rushing volumes of waters fertilizing thousands of miles. The coastal area is notable for bays and harbors, offering all facilities for shipping. Sydney harbor is admitted the most beautiful in the world. Australia is a land of wonderful scenery, and is not as poets have sung, a land of songless birds, and scentless flowers. With its tall gaunt Gum trees, its strange marsupials, and its endless plains, it is a land of vast distances, of great silence, but possessed of a fascination that thrills, in many respects it is indeed, the most unique of continents.

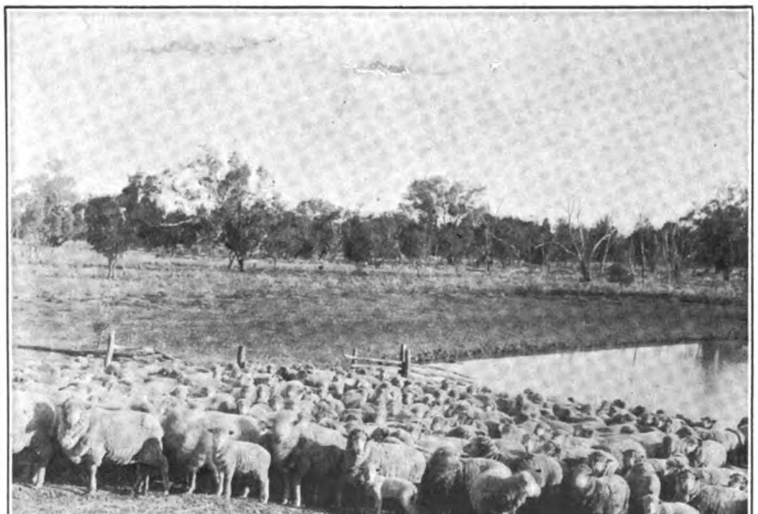
Australia is a sunny land, of genial climates, it is reputed to have one of the lowest death-rates of the world. The people of the continent live in open-air, free, and healthy life, this gives a decided individuality to Australian character, an independence of manner, and initiate, striking to strangers from the old world, or the East. Australian cities are handsome and modern, with electric tramways, fine streets, imposing buildings, public and private, rich institutions, and every class of domestic and commercial conveniences. Australia has now several interstate aerial mail and passenger services, and is arranging for a frequent eight-day trip to England. Wireless installations are counted by the hundreds, the service reaches to the ends of the commercial world. Sydney, the capital of New South Wales, has a population of a million people. Melbourne of Victoria, 700,000, Brisbane of Queensland, 250,000, Adelaide of South Australia of 100,000, Perth of West Australia, 100,000, and Hobart of Tasmania, of 50,000.

Australia has openly proclaimed to the world its ideal of a "White Australia." This is in some countries misunderstood. Briefly explained, the ideal is nothing more than a determination to keep Australia British, Australians whatever local characteristics they may have are distinctly British in ideals, customs, ways and manners. Australia is open to the trade of the world, but it must remain white and British, Australia has every right to its ideal, just as other nations have to theirs.

Australia is the land of many ideals, it has attracted the attention of the world in its reforms in social and industrial conditions. That it has not arrived at a full solution of most social, and industrial problems is very natural, but the fact remains the great Commonwealth is the paradise of the worker, where the highest wages, the shortest hours, the happiest and healthiest conditions are demanded by law. Commercially and industrially Australia has unquestionably made giant strides. Its chief occupations are sheep, wool, cattle, meat, dairy products, fruits, sugar, wheat, general farming products, timbers, sandalwood, minerals and gems.

Every state has its millions of sheep, the whole producing 700,000,000-lbs. of wool annually, and attracting buyers from all over the commercial and industrial world. The sheep bred are the purest to produce the finest qualities of wool. Australia, once looking to the old world for its stud sheep, now stands supreme in the breed of stud sheep, and which are sent to all sheep countries. No country in the world possesses the same natural advantages for stock-raising as Australia. Nowhere is there more absolute dependence placed on nature in regard to the feeding of stock. The pastoral areas of Australia are remarkable for being well watered, well grassed, free from marauding carnivora. Government supervision and laws prevent stock discases, or the possibility of inferior breeding. It must be acknowledged Australia offers ideal conditions for the raising of stock. As with sheep so with cattle, Australia can boast of the largest cattle stations or runs in the world. It is estimated there are 15 to 20 millions of cattle, and the breeds are from the purest strains. Works for the canning and preserving of meat are numerous, and Australian meat is exported to the world, large quantities constantly going to the East. Great quantities of tallow and hides are also exported. Government supervision again insisting on a clean and healthy meat export industry.

Wheat is very extensively cultivated in Australia, in most states there are climatic and other suitable conditions necessary to successful cultivation, Australian wheat is acknowledged as producing the best quality of flour known to the world's commerce. At one time it was thought wheat would never be cultivated in Australia, indeed, great agricultural scientists insisted Australian soil were lacking in phosphate, but this force was introduced, and the lands responded in a super-abundant yield of glorious wheat. During the war Australia practically maintained the world in wheat, to-day the yield is 150,000,000 bushels a year, and fresh areas are continually being brought under the plough. It has been found that the soil and climate of Australia has an heritage unequalled by any other coun-



80,000,000 Sheep producing 200,000,000 pounds of Wool make Australia the Greatest Wool-producing country in the World: a Sheep Station in Australia

try, Nature has it is evident designed Australia to be the ideal country for wheat. Dairying is an industry that has extended in a full and general way throughout the length and breath of the continent. Dairy herds are numerous and of unquestioned purity of breed. Milk, butter and cheese factories run like a chain round the land. The export of dairy produce is worth £50,000,000 a year, and of quality that has gained a worldwide reputation. The government regulations supervising the manufacture of butter are such that only a commodity of the best quality is allowed to be sent out to the markets. It is said that Australian butter now goes to every country in the wide world.

General agriculture covers many hundreds of thousands of acres in Australia, it has a magnitude which is a vital force in overseas markets. The value of farming produce, maize and other cereals, poultry eggs and other commodities is estimated at £10,000,000 a year. With it possibilities of wheat, and general farming Australia is one of the very few countries that could comfortably and liberally self-support a population of 100 millions.

As in farming so with fruits, both tropical and temperate climate, can be most successfully cultivated. The present annual export of fruits to overseas markets, and principally to the East is well on to £6,000,000 a year. Government regulations are insistent in quality, hence fruit pests and diseases are vigilantly watched for, and quickly destroyed. There is a tremendous future in the cultivation of fruit in the continent. Fruit growers are every day becoming expert in packing, and the art of long distance export is well-nigh perfect. At the present moment interesting ventures are going forward in the trial export of various kinds of fruits to various parts of the world, with cold storage fruit merchants are realizing fruits of almost any kind can be held indefinitely, if handled and watched with interest and care.

Sugar is a product that does well and is cultivated widely in Queensland and the north of New South Wales. The production is certainly costly in the wages paid labor, but as it is mostly for local consumption. Australians are willing to maintain a high price to guarantee white labor in the sugar fields. 1,500,000 tons of sugar are produced in the year, and this materially helps an industry which is becoming important and that is jam making. Australia can easily produce the fruits, and the sugar to keep the whole world in the finest quality of jams.

Australian timbers are of great variety, and all of commercial value. Hardwoods are famous for constructional timbers, it surpass the British oak, Indian teak, the Lignum vitae of the West Indies. Australia has many timbers of beautiful grain most useful for the making of furniture for house decoration. Queensland maple has now a wide-world reputation for these purposes. Cedars, pines, oaks, kauri and innumerable timbers are found in great forests all over Australia. Sandalwood from North Australia, mostly Queensland, is exported in very large quantities annually to China.

The mineral wealth of Australia is considered inexhaustible. In the last fifty years £1,000,000,000 worth of minerals, including coal, have been exported. At present the mining industry is suffering a slump, in the poor world demand for one thing, and in the demand of high wages for miners. But there are signs that go to show the industry is likely to revive. In the matter of gems, opals and other precious stones, the state of Queensland is making much progress, and there is a steady and growing demand from Europe, India, China, Japan and America for Australian gems. The recognized finest quality pearls are got from the shallow sea of the Torres Straits Islands in the northern waters of Australia.

Cotton was many years ago cultivated in Queensland, but the industry declined. To-day, and for the last three years, there has been a very remarkable spread of the cultivation of cotton in the whole of Australia. How it is progressing can be understood when from Queensland along £60,000 worth was last year sent to Liverpool. Ginneries, modern and commodious, are being erected in all the states. Governments are subsidizing the growers, and by drastic regulations keeping cotton crops healthy.

Many other products might be taken and details given of their successful cultivation and progress, it suffices to say nothing is being carried on or attempted in Australia but has every promise of success. With the production of products, so is trade keeping pace. Australia is a land of vast resources, unlimited commercial possibilities, it is a veritable land of promise, to the capitalist and the trader it is a great land of opportunities.

In the prosperity of Australia so assured by generous nature, it is hoped that China and the East, will, by trade materially assist, so as to make the Commonwealth of Australia a great commercial nation.

Chinese Make Paper From Bamboo

PAPER has been manufactured in China since the beginning of the Christian era, writes H. K. Richardson in *Chemical and Metallurgical Engineering*. Paper money is mentioned in the history of Szechuan as early as A.D. 960. To-day this industry is carried on in much the same way as it has been for the past ten centuries.

Many different kinds of paper are made in the western provinces of Szechuan and Kweichow, of which four are of particular interest. These are:

1. Kou pi chih, or bark paper, which is made from the paper mulberry, probably the original paper made in China.
2. Rice paper, so called, which is sliced from a pith.
3. Ts'ao chih, or coarse paper, made from rice straw or reeds.
4. Chu chih, or bamboo paper, made from young bamboo trees.

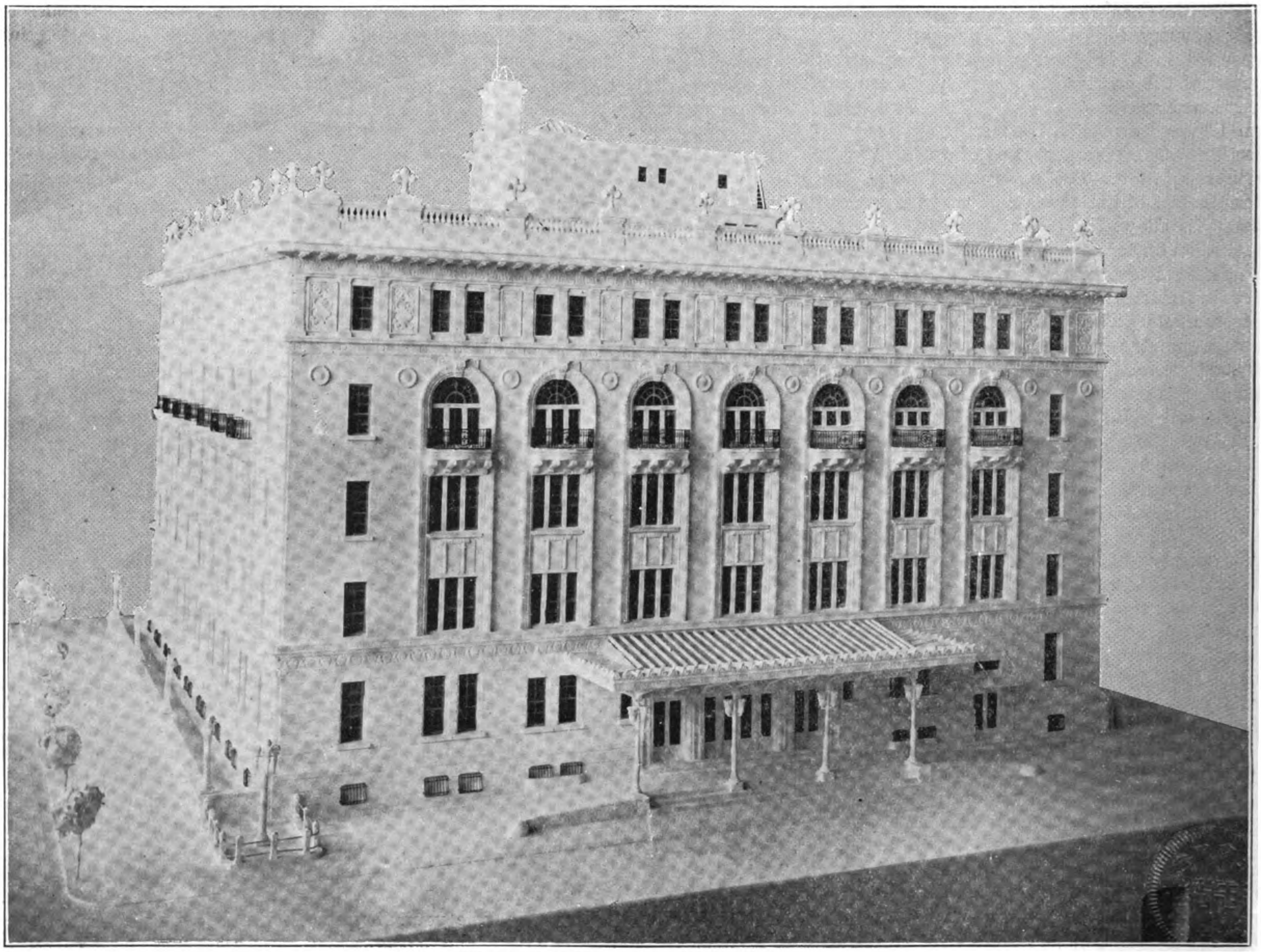
Each of these papers is made by a method more or less distinctive, but chu chih is the most interesting.

The best paper produced in Szechuan is made from bamboos by a process said to be over ten centuries old. More than thirty varieties of bamboo grow in western China, of which only two are commonly used for paper making. These are tzu chu or spiny bamboo, bambusa arundinacea, and ch'ung chu or grove bamboo, phyllostaclys heteroclada. The second is used by most paper makers. This variety grows to a height of sixteen to eighteen feet and is one and one-half to two inches in diameter. It grows to the full height in about two months, naked of leaves. When the full height is attained leaves spring out at each joint, which roughly represent each day's growth. Most Chinese paper makers prefer to use the young culms before this leafing-out occurs, for they say the leafing-out process hardens the nodes and makes them difficult to reduce by the usual retting process.

The process used to turn this bamboo into paper varies a little in the different parts of the province. The process as it was observed in the district along the Chengtu-Wanhsien Post-road will be outlined here.

The bamboo is cut into eight-foot lengths and then split lengthwise into eight parts. The split cane is laid in pits with alternate layers of lime, about 10,000 catties of bamboo with 1,000 catties of lime making up a charge. The matted bamboo is weighted down with stones and covered with water, in which condition it is permitted to stand for two months. The bamboo is then removed, washed and soaked for two months in clean water to bleach out the lime. The water is drawn off and the mass permitted to rest in this moist condition for the months after which it is hammered to a pulp in a mortar or stone mill and finally is rubbed to a fine pulp in a stone trough by stamping under foot. This pulp is mixed with cold water and mucilage 'n stone vats, after which it is dipped out on hand frame where are stacked in a press and pressed semi-dry. The sheets are dipped singly into rice water and are then dried on the side of a hot kiln.

Hosie and Wilson, describing the same process, state that the first reduction of the fibre is done in the vats with wooden rakes. They also state that 1 to 3 per cent. of the soda is added to the slaked lime in the retting process. It is known that caustic soda is sent to the Chungchow and Mienchu districts for paper making by importing firms. This use may account for the fact that the paper from these districts is whiter and better than that from the other districts. Probably a much larger amount of caustic would be used if the $200 a ton freight charge and the extra importing commissions did not make the price almost prohibitive.

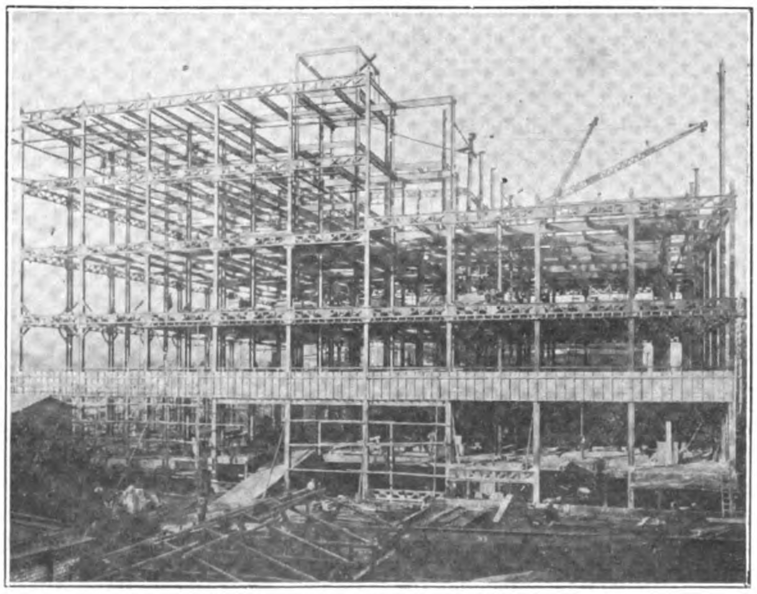


Model of the New Palace Hotel at Tokyo

Magnificent Social Centre for Tokyo

ANOTHER magnificent three million yen hotel and amusement edifice is rapidly nearing completion in Tokyo and is expected to be finished some time during the month of November. This is a handsome five storey building in Marunouchi near the Imperial Theatre, in the centre of Tokyo's business district, erected by the Shimizu Gumi, one of the best known firms of Japanese contractors for the Tokyo Kai Kan Company. The building will embrace all the features of a high-class amusement and entertainment palace combined with those of a first-class hotel and will be equipped throughout with the most modern sanitary, heating and other facilities and furnished with the most luxurious fittings.

In the basement of the building will be located the kitchens, boiler room, ice machine, storage and rooms for employees. The first floor will have the regular dining room, bar, billiard rooms and parlors. The second floor will be given over to special dining rooms and the third floor to Japanese entertainment rooms, while the fourth will be taken up by the grand dining room. The fifth floor will be divided into guest rooms. The roof will have a garden.

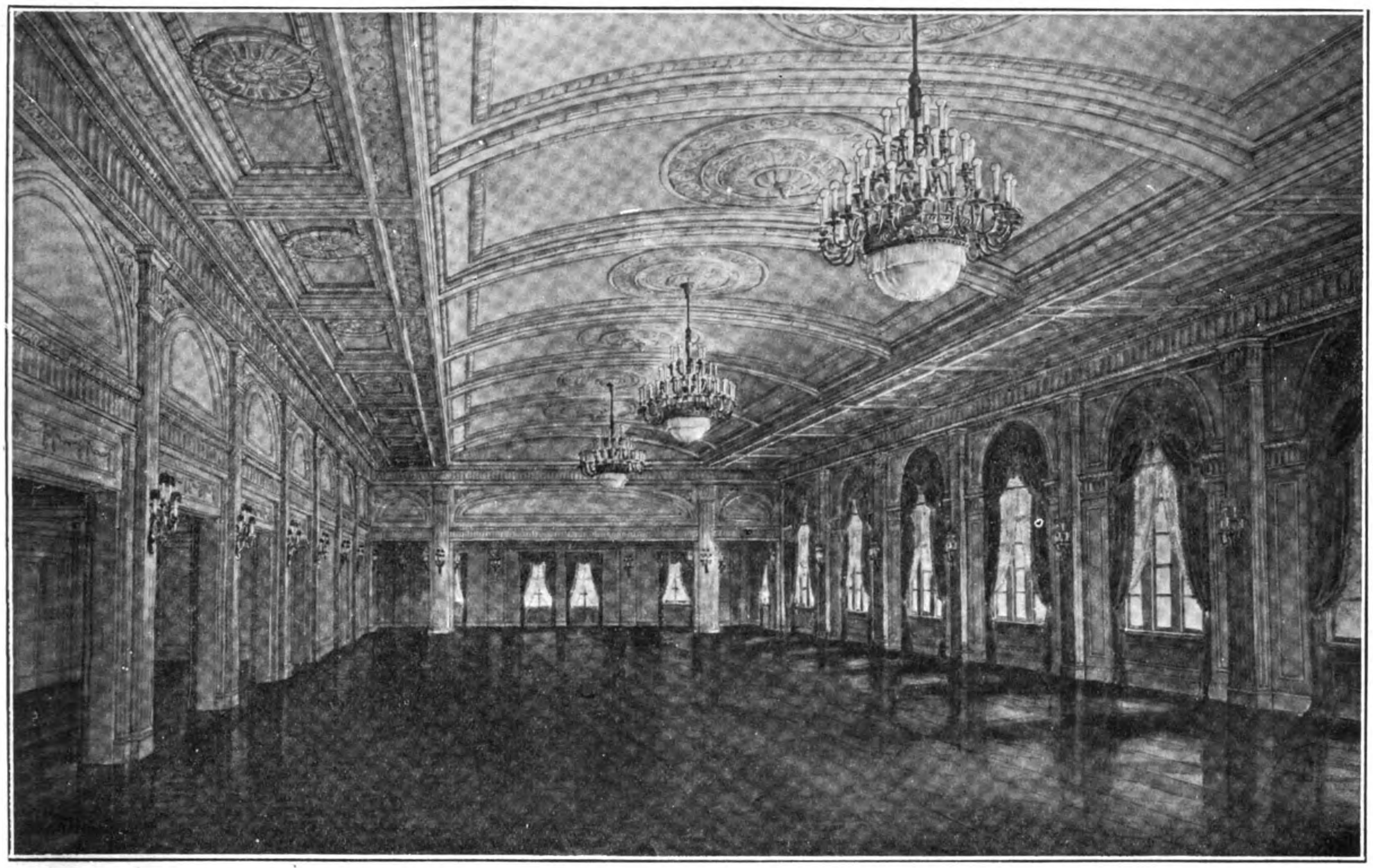


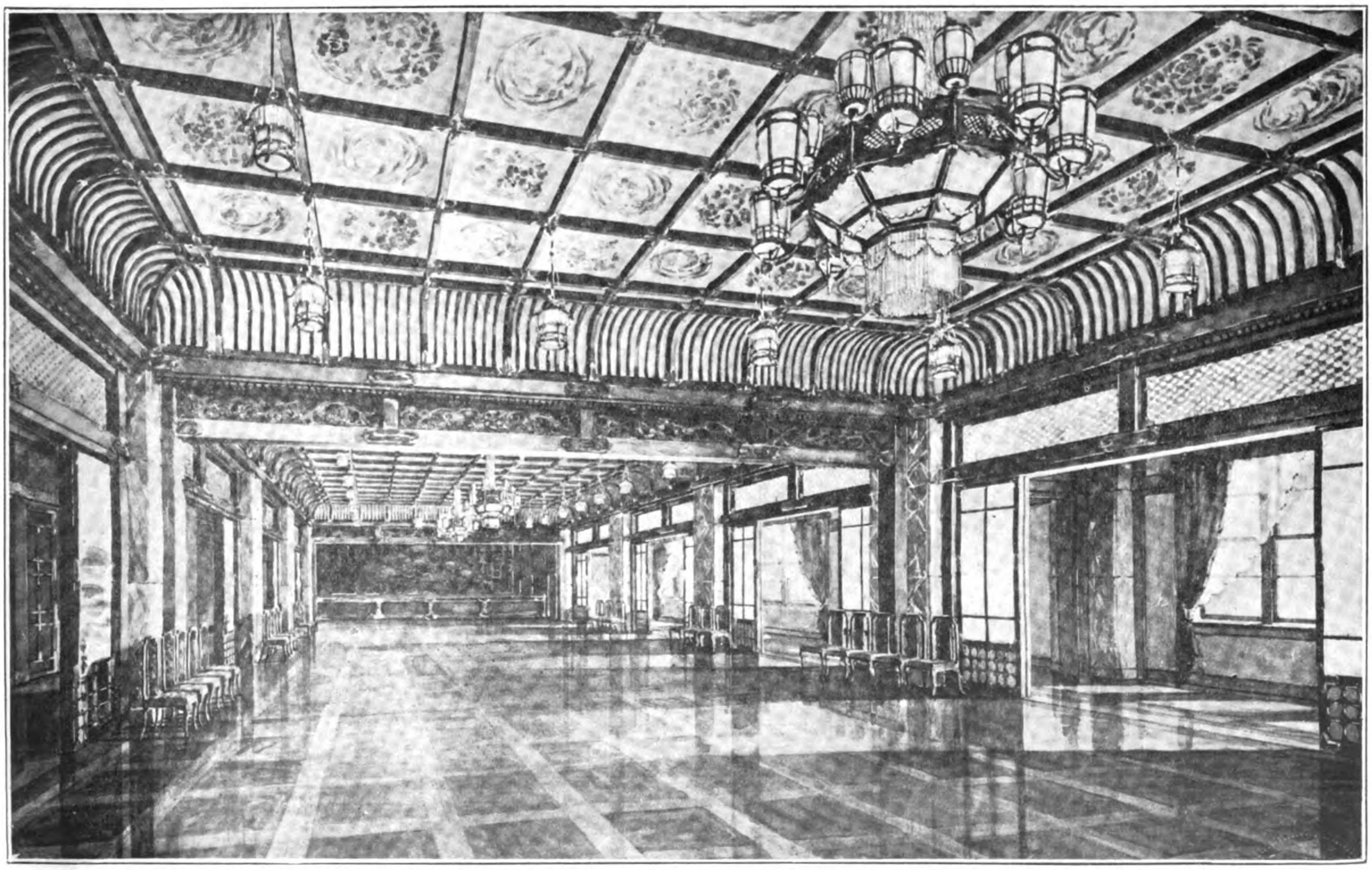
Palace Hotel at Tokyo in Course of Construction

Separate stairways will be built for ascending and descending and for employee's use and two elevators installed for carrying the food from the kitchens to the dining rooms and for transporting baggage. There will be four passenger elevators. The entire building is of reinforced concrete, the outside walls finished in with bricks trimmed in marble and rock quartz. All partition and floors are of re-

inforced concrete, and the tank on the roof with a capacity of 7,500 gallons will supply the building with water. In addition to all up-to-date fireproofing, two fire escapes are also installed.

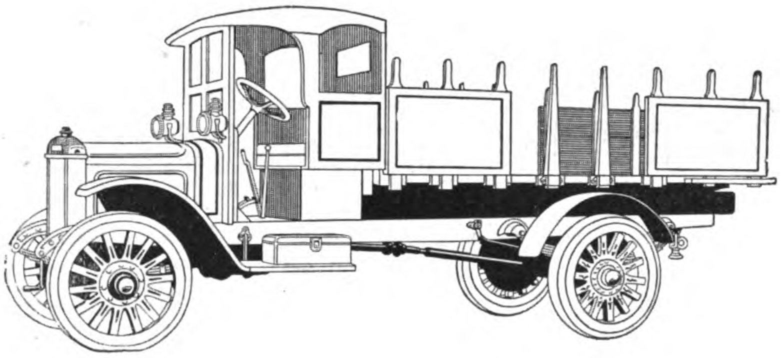
Hot and cold air ventilation is provided for ball and dining rooms. Mr. R. Fujiyama, chairman of the Tokyo chamber of commerce, will be manager of this magnificent new hotel, which will cater largely to Japanese. The building is specially designed for the accommodation of the many private social functions, such as weddings, banquets and Japanese ceremonies, which form such a large part of Tokyo's social life.





THE BALL ROOM (top) AND CONCERT ROOM (bottom) OF THE NEW PALACE HOTEL AT TOKYO

"UNEQUALLED SERVICE TO THE USER"



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MOTORING-AERONAUTICS-MOTOR BOATING

Body Building in Shanghai

Works of the Shanghai Horse Bazaar & Motor Co., Ltd.

ONE of the most up-to-date and complete body building plants in the Far East, equipped with modern machinery and appliances throughout, is operated by the Shanghai Horse Bazaar and Motor Co., Ltd. This firm was established in 1851 as the Shanghai Horse Bazaar, Ltd., and with the growing importance of the automobile and the increasing demand for dealer representation, the directors looked over the field for a suitable agency. The company took as its first motor car agency the representation of the Berliet, and with this new departure, added the word "motor" to its corporate name in 1914. The firm are now agents for the Rolls-Royce, Studebaker, Arrol-Johnson, Vauxhall, Fiat, Maxwell and the Berliet cars.

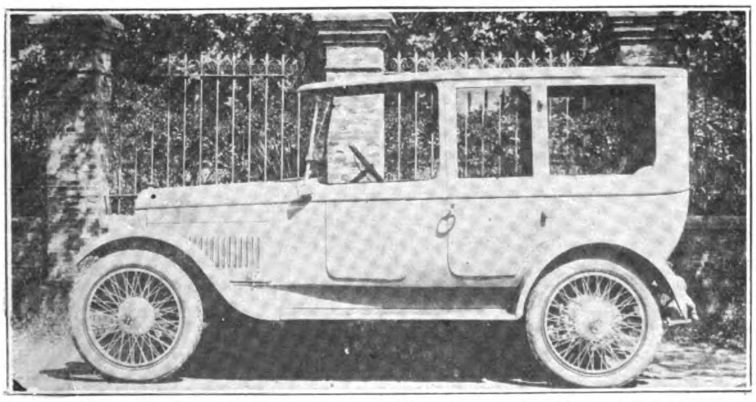
Because of the high freight rates, duty, insurance and the dozen and one little things that enter into the selling costs and which all help to increase the price of the cars, it was deemed more practical to bring out the chassis and build the bodies in their own shops. This idea not only proved profitable, but created such a demand for custom built bodies, that in the fall of 1916, their facilities were taxed to such an extent that they had no alternative but to seek larger quarters to take care of their orders. The result was their expansion to the buildings directly across from their Burkill-road entrance.

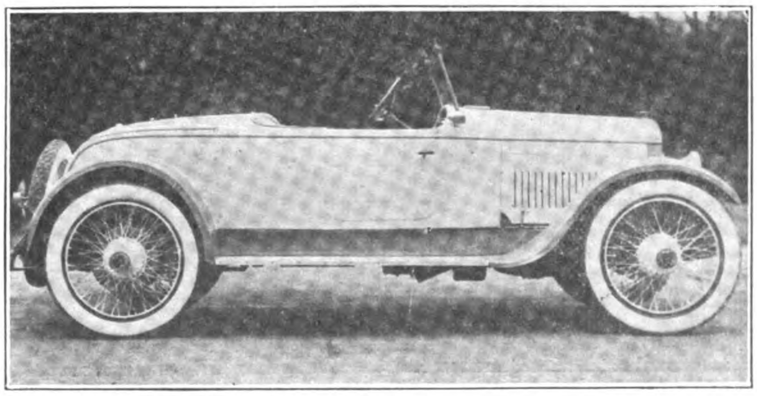
The new and enlarged quarters were remodeled to suit the needs to which they were to be put. This necessitated but little work and with the installation of modern equipment and appliances, the plant was soon turning out finished jobs. Since then it has been necessary to install further new and up-to-date equipment in order to facilitate the work and at the same time maintain the high quality of workmanship for which the Shanghai Horse Bazaar and Motor Co. pride themselves.

The various departments are under the care of trained Chinese, while a staff of foreign experts supervise and inspect all work that is done. All the various articles that go to make the bodies are specially imported from America and Europe.

Starting with the carpenter shops and ending with the sales rooms, one is surprised to find such an up-to-date plant in the Far East. The framework for the bodies is made from selected ash, properly seasoned. Those unexposed parts that are liable to strain are reinforced with steel braces that are forged in their own blacksmith shops. From here the car is sent to the next department where the aluminum body is cut and fitted to the frame. This being done the seams are welded and filed smooth. The car is then ready for the tailors, who, with a knack that comes from long experience, soon have the weather-proof top fitted with such exactness as to make the down-town tailors look to their laurels. The next operation is the fitting of the windows, wind shields and the side curtains. If the car should be of the closed type, the glass is packed with rubber tape to prevent rattling and is set in brass frames that are nicked plated to prevent rusting.

With the completion of the last operation, the car is ready for the painter. But before the paint is applied, it is first gone over with a portable electrically driven revolving brush. This process both cleans and shines all the metalwork, and so eliminates any possibility of spots on the finished job. The painter then goes very carefully over it with a filler. When this has dried, the paint is applied with an air brush or what is more commonly known as the spray system. This system insures an evenly distributed coat



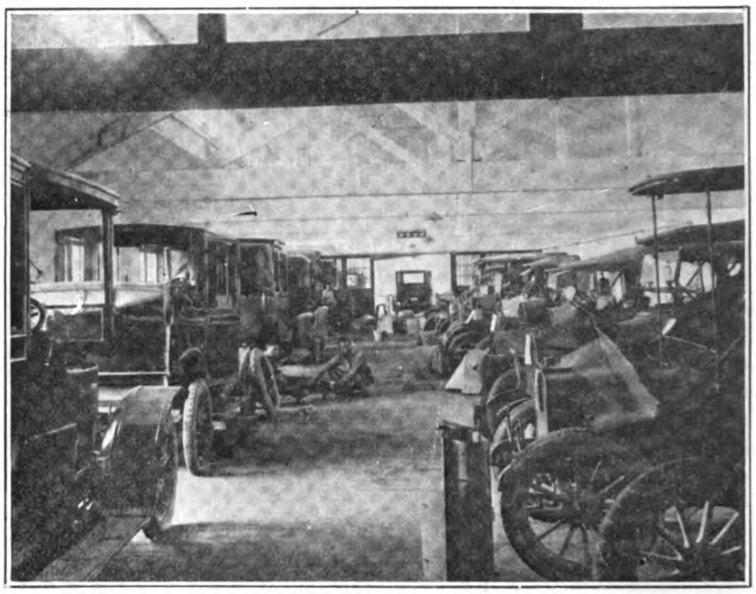


Samples of Coachwork by the Horse Bazaar on Light Six Studebakers

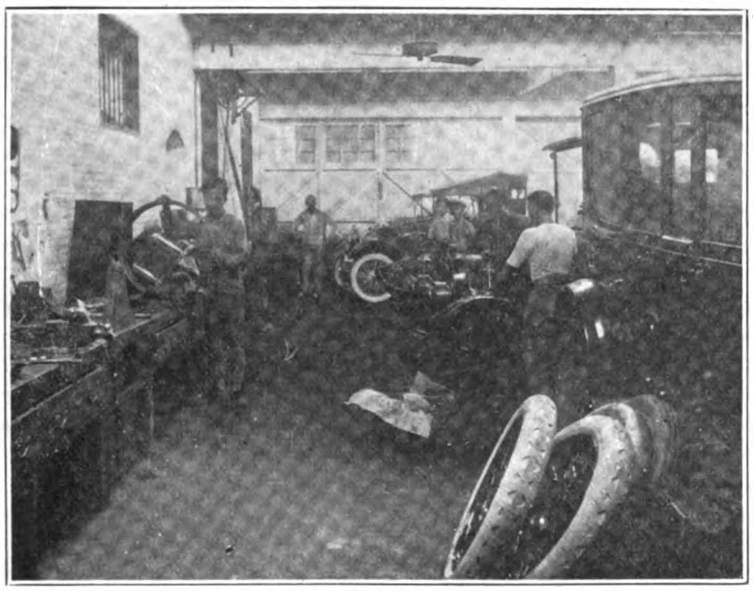
of paint and eliminates any hairs from adhering to the surface. The average number of paint coats is three and with the drying of the last, it is sent to the varnish room. This is a dustproof room that accommodates four cars. The temperature of this room is controlled by a rheostat, which automatically maintains an even heat. The plant has a capacity of 100 paint jobs and 25 bodies a month.

The floor of the garage is capable of storing 150 cars, while private stalls accommodate another 100. Attached to the garage is a complete machine shop, equipped with lathes, drills, power cutters and hammers, air-compressors and modern appliances of every discription. A modern vulcanizing and tire shop is also on the premises. Three hundred winter tops can be stored in a special room for that purpose. The battery recharging department has two motor generators with a capacity of recharging 400 batteries per day. In conjunction with this is a testing room fully equipped to test any and all kinds of electrical equipment. Some idea of the diversity of the accessory stock is gained by noting the fact that 7,000 parts and accessories are being carried in stock.

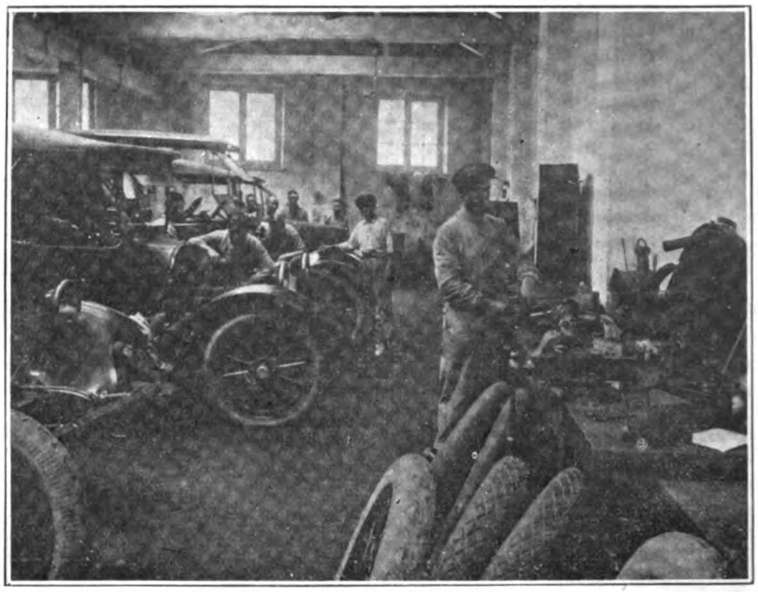
The importance of the Shanghai Horse Bazaar and Motor Company's organization is indicated by the 450 odd workmen employed by the motor department alone.



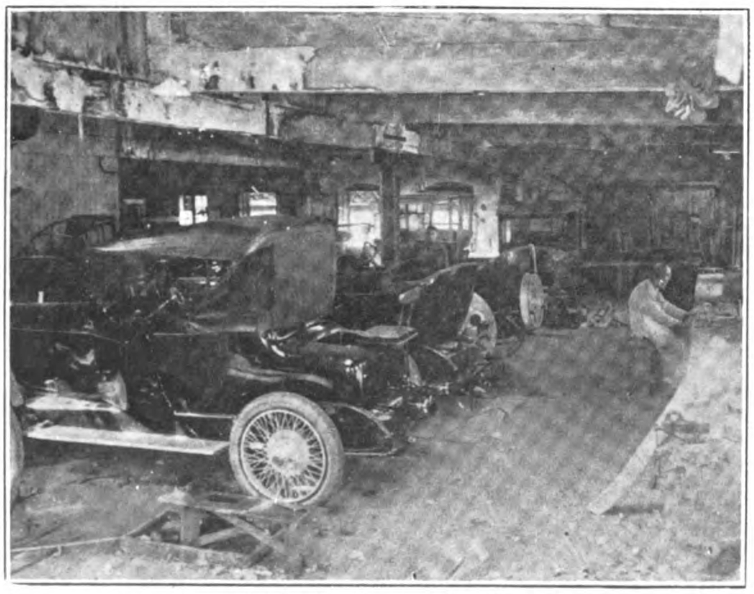
Part of the Paint Shops



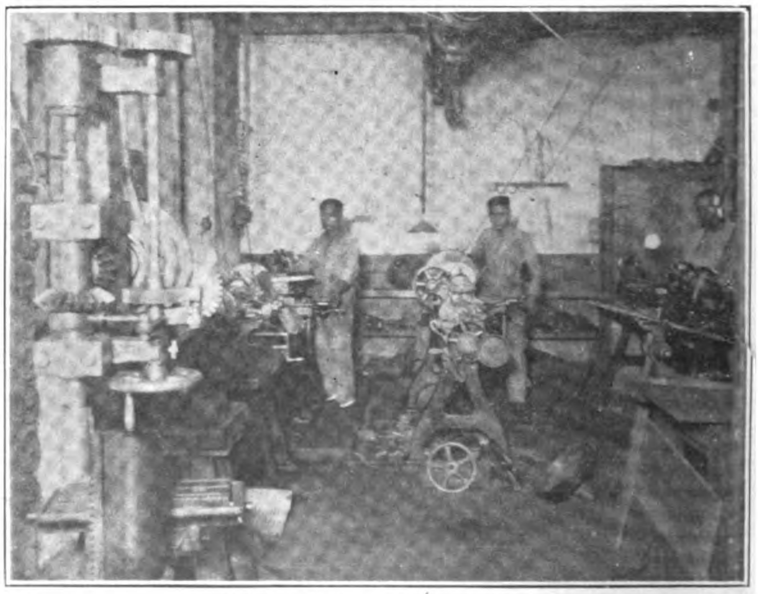
Repair Shops



Repair Shops



Part of one of the Floors Devoted to Body Building



A Corner of the Machine Shop

15-Ton Heavy Duty White Truck and Semi-Trailer of the Shanghai Electricity Department

Largest Truck in the Far East

IN order to meet the constantly increasing demand for electric power and with the growing importance of Shanghai as the industrial centre of the Far East, the Shanghai municipal council, last year, received from the International General Electric Company's wire and cable department, 120,000 feet of what is said to be the largest armored cable in the world.

The cable is of what is known as the split conductor type. It measures about four inches through, and is slightly more than a foot in circumference. Its weight per thousand feet is 18,072 pounds, which would make the amount of cable ordered by the council weigh over 1,084 tons.

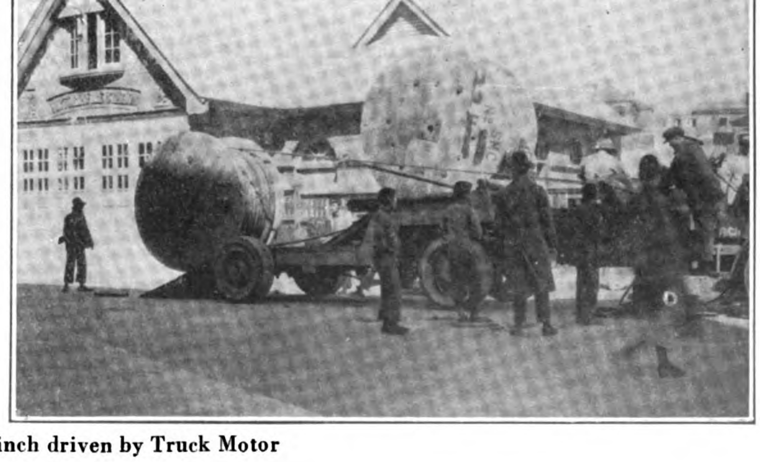
Of further importance is the recent delivery to the council of a specially designed motor unit for the hauling of heavy electrical transformers and cable drums, the largest truck of its kind in the Far East. The equipment was manufactured by the White Company, one the largest manufacturers of high-grade motor trucks in the United States.

The unit consists of a heavy duty tractor and semi-trailer, capable of carrying a maximum load of fifteen tons. The tractor is equipped with a power winch which is operated by the truck engine through a special White power take-off and driving tower. Niggerheads or spools, are mounted on each end of the winch drum shaft. These may be operated independently of the drum, permitting the cable drum to be used on straight pulls while extra pulls may be made from the niggerheads without the necessity fo manœuvring the truck into a different position.

The tractor chassis has been specially constructed to deliver the maximum tractive power, the gear ratio being much lower than standard and the rear wheels smaller in diameter. The winch may be used for loading or unloading, as illustrated in the accompanying photographs; or for pulling cable through conduits or wires over cross-arms, etc. The wide range of usefulness of such equipment means great saving in labor and time in many lines of work.

That this new motor unit is more than meeting expectations is attested by the official of the electricity department. The fitting of this truck to the special work required of it is an excellent example of the effort on the part of the manufacturer to help solve transportation problems as well as to sell trucks.

The Ujigawa Denki Kabushiki Kaisha of Osaka, Japan, which furnishes most of the electric power for this, the largest industrial city of Japan, has recently purchased another 2-ton White truck, equipped with power winches through Sale & Frazar Ltd., White distributors for the Japanese empire. This truck will also be used for the purpose of hauling cable drums, and the numerous other uses to which a winch truck may be put.



Loading Cable Drums with Winch driven by Truck Motor

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Builders of steel and wooden craft of any draft to suit inland waterways and harbor service.

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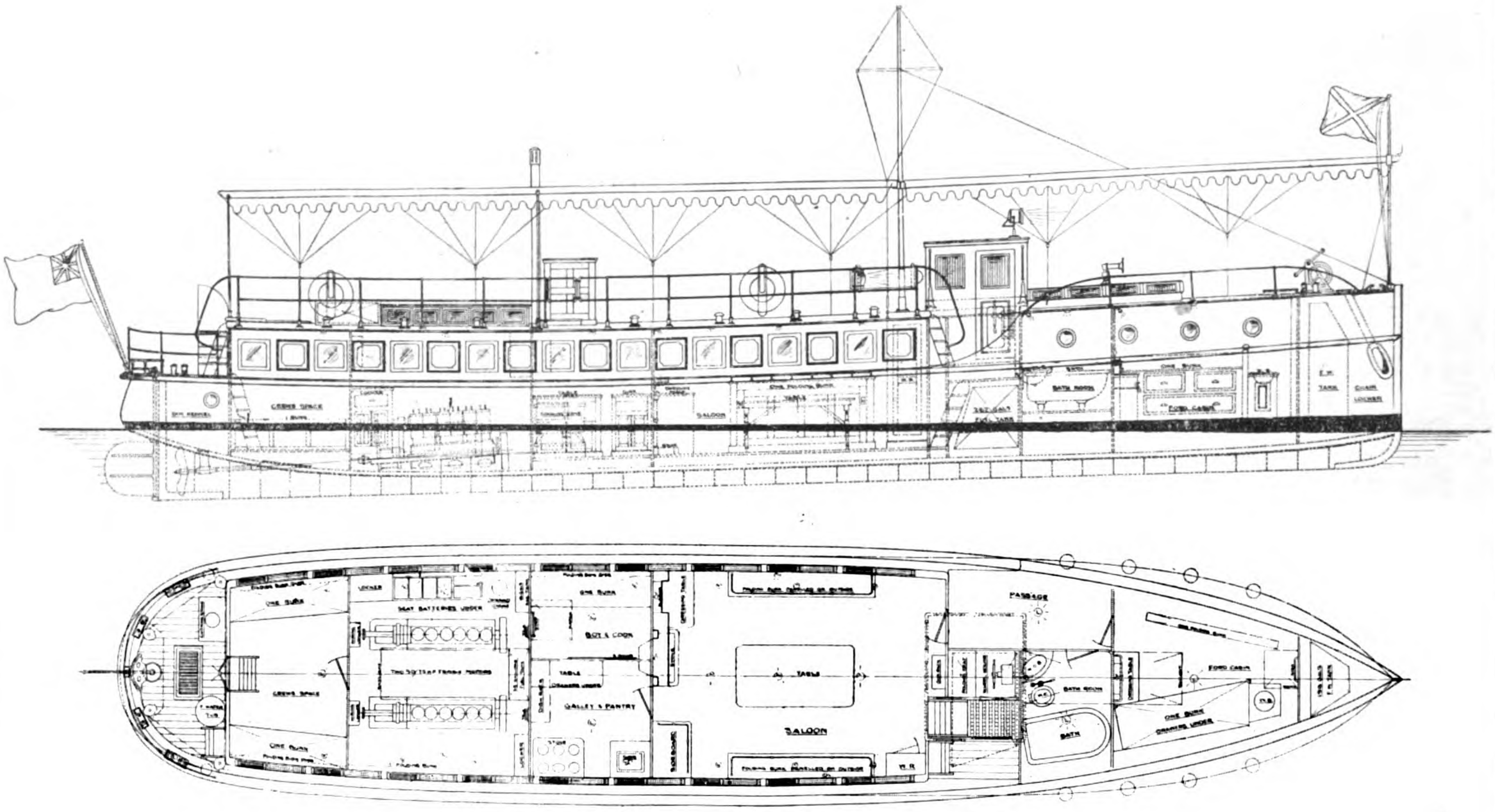
Motors and complete launches in stock.



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WORKS—POOTUNG :
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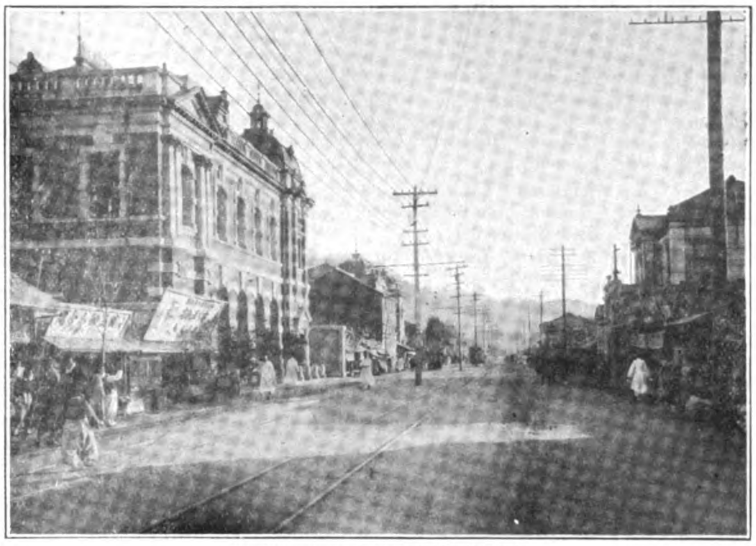
8A YUEN-MING-YUEN ROAD

SHANGHAI

Road Building in Korea

BEFORE the establishment of the government-general, regulations relating to civil engineering were practically non-existent, and public properties, such as roads, rivers, etc., were in a most neglected state and subject to abuse by the people, so much so that the local authorities were powerless to check them. Though the introduction of the protectorate opened the way for reforms in these matters, the lack of resources prevented any solid foundation being laid, and it was only possible to take in hand that which was urgently necessary. But, on annexation being effected, the government-general at once put forth efforts to improve this condition, and from 1911 onward promulgated regulations relating to roads, urban buildings, vehicles, rivers, reclamation works, etc., and not only laid a solid foundation for civil engineering administration but also engaged in the repair of roads, harbors, etc., on a large scale, and started the systematic investigation of the principal rivers in the country.



An Improved Street in Seoul

Road-making was all but an unknown science, and roads worthy of the name were consequently lacking, thus completely blocking all progress, so it was planned to construct a regular network of them under four classes, of which the first and second were to be constructed and maintained by the central government, the third by the provincial governments, and the fourth by prefectural municipalities, districts and islands, except that in urban districts all classes, where necessary, were to be controlled by the prefectural municipality.

When repairs were made in olden times the *Puyok* or corvée, that is, compulsory service, was put into force, and this usage was continued even after the annexation, especially with regard to those persons unable to discharge their duties by a monetary payment. In addition, it was customary to induce the people to surrender land for roads free of cost. With the reform in the government organization all this was changed, and in October, 1919, it was decided that the construction of first and second-class roads should be conducted at national expense, corvée abolished, and the land necessary purchased at a fair price, resort to the old custom being allowed only in the case of third class roads, as these were closely connected with local interests.

The introduction of a fundamental system regarding rivers was also necessary, but investigation of them not being completed, regulations concerning them touch only on their utilization and preservation. The same is the case with harbors, open ports, naval ports, and certain others under the direct control of the government-general or of the provincial governments.

Other public undertakings of various kinds often require the expropriation of land, so in 1911 a land expropriation law was promulgated that the smooth development of such enterprises might be secured.

Road Improvement

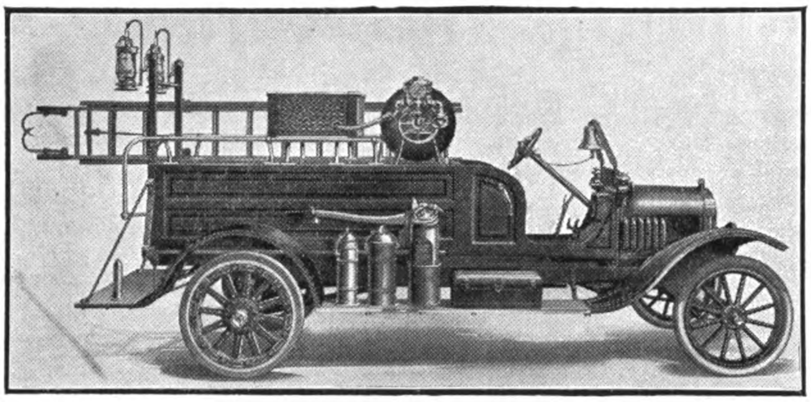
It goes without saying that the maintenance of roads in good repair is most necessary, so during the four years of the protectorate *régime* over Y.3,900,000 raised by industrial loans and from other sources was spent in repairing roads aggregating more than 200 *ri* in length, but the work done was far from thoroughgoing, and, taking the country as a whole, good roads were decidedly lacking, and traffic and transportation were conducted with difficulty on foot or horseback along narrow, deep-rutted, and meandering tracks, thus effectually preventing cultural progress and economic development.

In order to overcome this obstacle to progress the government-general regulated that first-class roads were to be four *ken* or more in width, second-class roads three *ken*, and third-class roads two *ken*, and also engaged in the repair of roads in a systematic way.

According to the network of roads projected by the government-general, those to be constructed at national expense are 17 of the first class measuring 789 *ri* in length, and 79 of the second class measuring 2,352 *ri*, while those to be constructed at local expense number 419 of the third class measuring 2,839 *ri*. As the expense of keeping them in repair is great, the work is done in sections, and those most in need are first taken in hand.

Road to Onyo Hot Spring

Road to the Jyujo Hot Spring



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That is a conservative estimate of the cost of time lost in getting to fires. To protect small towns, we have mounted complete chemical equipment, hose body, ladders, axe, and hand extinguishers on a Ford Chassis.

These sturdy trucks are speedy and save many valuable seconds in the early stages of a fire. The chemical equipment used is the same as that used on apparatus in the largest cities. Tank is of forty gallons capacity.

We are also manufacturers of commercial motor trucks, and other types of fire-fighting apparatus.

Write to-day for further particulars to one of the following:—

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We have four grades of Auto Oils to meet every condition and requirement of the motorist.

Auto X Light
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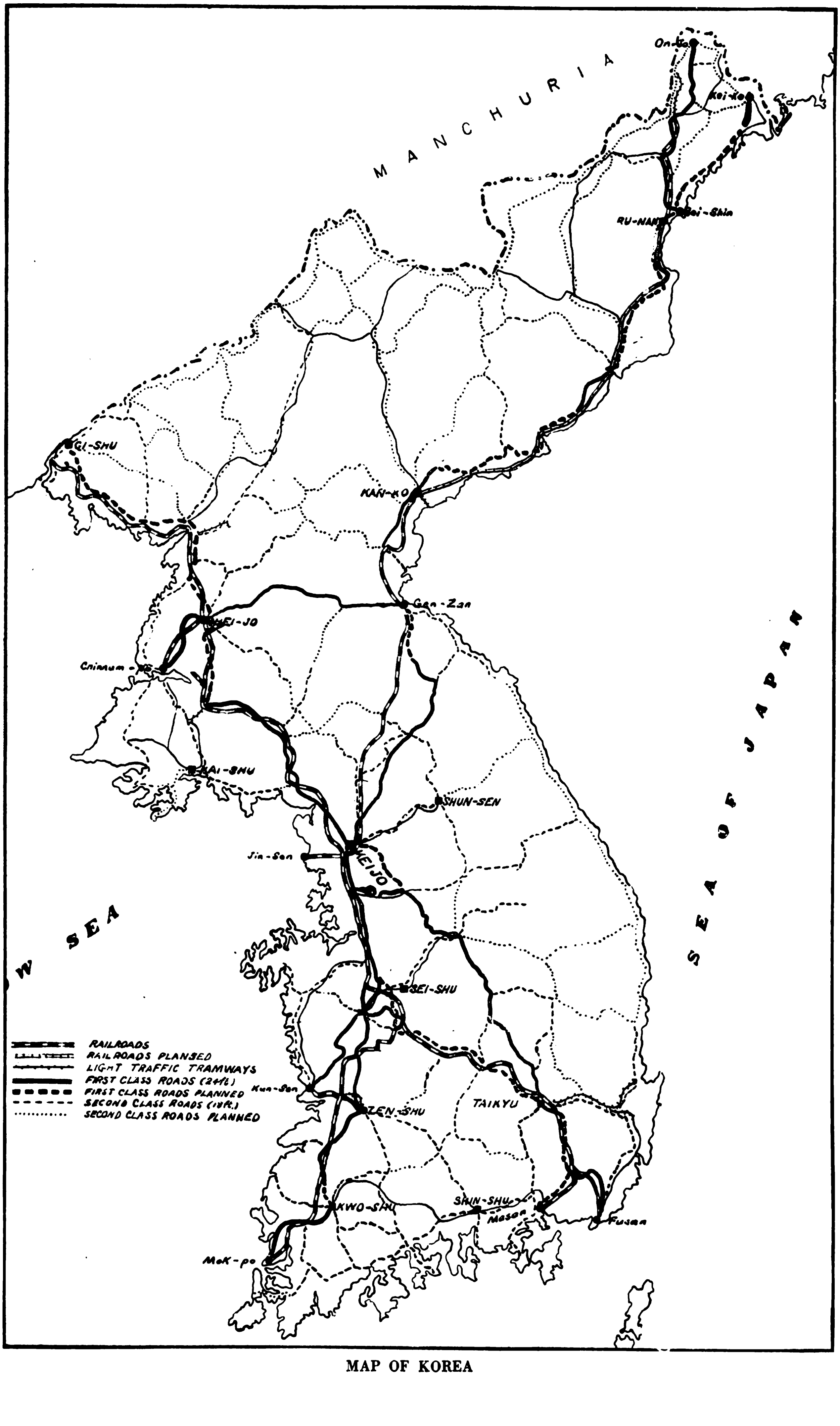
Obtainable at any Garage in China

The first program of the government-general was completed in October, 1917, at a cost of Y. 10,000,000, and comprised first and second-class roads measuring 685 *ri*. This work took seven years to accomplish, and during the latter years an iron bridge was constructed over the Kan river.

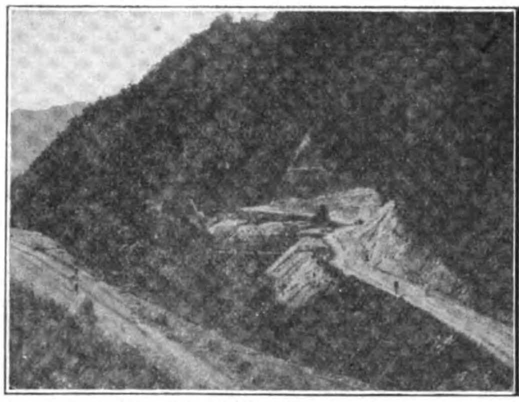
For its second program the government-general plans the construction of 26 first and second-class roads measuring 478 *ri*, and nine bridges, and entered in the budget estimates amounting to Y.7,500,000 spread over the six years from 1917 to 1922. Although it is in the course of execution, the rise in price of material and labor and the inclusion of several new roads in the program have necessitated an increase in the first estimates for it.

Besides directly engaging in the work the government-general has annually subsidized the provinces to the amount of from Y.100,000 to Y.300,000 to assist them in building third-class roads, and, moreover, expended Y.3,-000,000 in bringing over 900 *ri* of first and second-class roads and over 1,800 *ri* of third-class roads into conformity with the regulation standard of width.

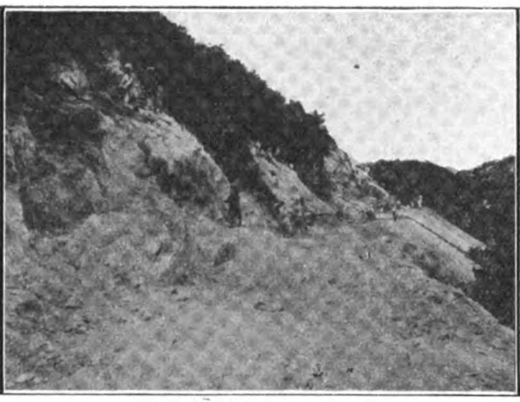
According to the latest investigation the length of roads already constructed is over 1,700 *ri* of first and second-class roads and over 1,800 *ri* of third-class roads, or 56 and 60 per cent. of the lengths set down in the projected network, while roads traversed by public automobiles measure over 1,000 *ri*. Thus a complete



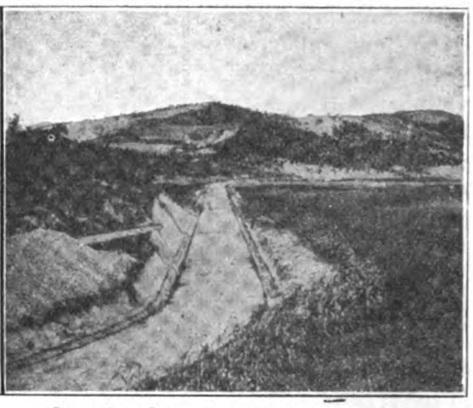
MAP OF KOREA



Excavating on the Seishin-Kainei Road, North Kankyo Province



Mountain Road Making in Keiki Province



Completed Section of the Shinshu-Shoshu Road

transformation has been effected in traffic and communications throughout the peninsula.

The latest statistics for roads and vehicles compared with those for 1911 are given in the following table :—

LENGTH OF ROADS COMPLETED.

	End of 1911 *ri*	End of 1920 *ri*
First and second-class roads	200	1,759
Third-class roads	7	1,134
Total	207	2,893

Note.—The length of third class roads is that existing at the end of 1919, and takes in only those roads conforming to the standard of construction.

NUMBER OF VEHICLES.

	Rickshaws	Carts	Ox-wagons	Horse-wagons	Carriages	Automobiles	Total
End of 1911...	1,217	1,804	38,337	585	110	2	42,055
End of 1918...	4,811	18,236	63,294	2,614	231	(End of 1920) 447	89,633

Street Improvement

Towns in Chosen for the most part contain narrow, dirty and crooked streets, causing great inconvenience to communications, and sanitary and fire-brigade arrangements, and naturally hindering their development, so of late years much has been done for their improvement by straightening, grading and widening existing streets, and by constructing new ones as circumstances required.

Keijo is the capital of Chosen and quite different in scale and plan from other towns, so it was decided to conduct street improvement in it at national expense, and 43 of its streets were selected for improvement, of which 13 were completed at a cost of Y. 3,000,-000 in the eight years from 1911 to 1918. The most important of these were made 12 to 15 *ken* in width and provided with pavements, and where the traffic is heaviest the macadamized surface is tarred, while the other roads were made not less than 8 *ken* in width, thus bringing about an extraordinary change in the appearance of the city.

The second program takes in nine streets, the budget estimate for which is Y.2,400,000 spread over six years from the fiscal year 1919, and this is now in the course of execution.

Other towns marked out for street improvement were Heijo, Taikyu, Shingishu, Fuzan, Chinnampo, Seishin, Moppo and Genzan, towns in which provincial offices are situated, and certain others of some importance. The expenditure on these is defrayed out of the local revenues, sometimes assisted with a subsidy from the national treasury, and not a few of these towns have already carried out the projected improvements.

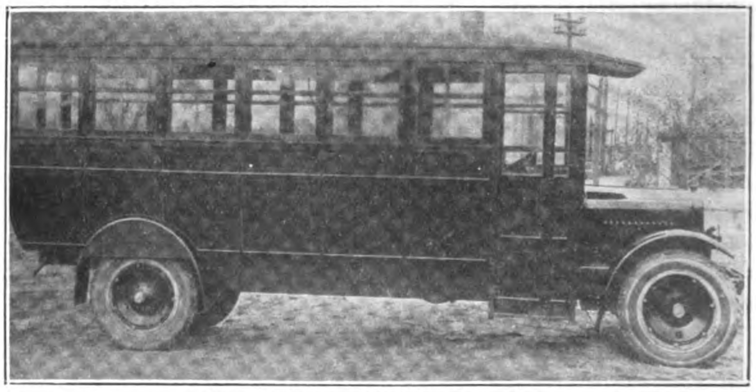
Chosen is far from being as developed as Japan proper, but, as its future development will be comparatively rapid, it is necessary to lay down the fundamental plan for street improvement now, and make the various connected arrangements conform to it, therefore the government-general has incorporated in the budget for the fiscal year 1921 an item for investigation regarding city improvement, and has begun the work in four large cities, viz., Keijo, Fuzan, Taikyu and Heijo.

A proper sewerage system is a very necessary aid to sanitation, so its establishment is being carried on side by side with street improvement. The city of Heijo is spending Y. 580,000 in the 11 years from the fiscal year 1913 to 1923 on this work, and Keijo, Y. 1,600,000 between the fiscal years 1918 and 1924. Part of the money thus expended is provided by the national treasury and part by public bodies.

Standardized Passenger Bus Introduced by Large Lorry Manufacturer

PASSENGER transportation by motor bus has grown to such large proportions during the past few years, and there are such great numbers of these vehicles in use at the present time, that a large American motor lorry manufacturer—The General Motors Truck Company, of Pontiac, Michigan, U.S.A.—has felt the advisability of introducing a completely standardized passenger bus, capable of accommodating passenger transport needs of a wide variety.

This Company makes the point that passenger buses to-day are almost universally built upon a regular commercial car chasiss,



New K-20 type G.M.C. Motorbus

which chassis has marked disadvantages for passenger transport service from the viewpoints both of speed and riding quality.

With this in mind, the General Motors Truck Company began at the very foundation of things when designing their new model K-20 passenger bus, by constructing a special chassis on which the passenger body is built.

This special chassis is a happy medium between the great strength with corresponding rigidity of the regular lorry chassis, and the speedy and easy riding, but somewhat light typical passenger car chassis.

The K-20 special bus chassis has power and speed to spare, but at the same time its chassis units are very sturdily built, and there is a large margin of safety in every part of its construction.

Notable features of this K-20 chassis are its speed of 30 miles per hour with a normal engine R.P.M., its exceptionally large area

of brake service—more than is built into the average two ton lorry—its sturdy rear-end construction with radius rod bracing, and its surplus of power for every emergency.

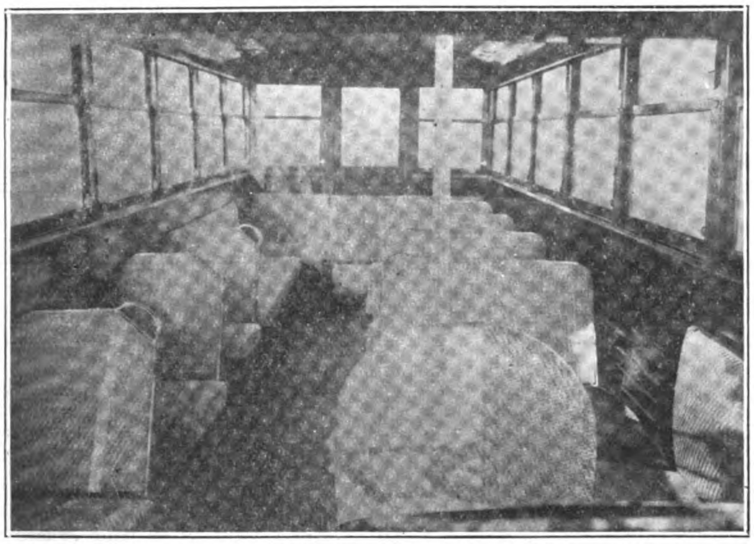
Steel disc wheels practically eliminate wheel breakage possibilities. Large pneumatic cord tires insure easy riding on the part of passengers, and these tires are fitted with all-weather tread to minimize skidding.

Each detail of the special K-20 chassis has been planned with the points of quietness and lack of vibration kept always in mind. The engine is silent in operation, and the transmission gears are accurately—cut and well—fitted. The clutch is an oversize unit of the dry-plate multiple disc type, and is quiet, smooth and positive in action.

On the long 178-in.—4.52 meter—wheelbase of the K-20 bus chassis, the General Motors Truck Company are building a body that is the result of a careful study of passenger transportation needs. The seats, of rattan, are extremely easy to ride on, and in this they are aided by the long and elastic springs that are utilized in the K-20 chassis.

Seat-backs are shaped to conform to the body, and are set at a comfortable angle. Bronze hand-holds are set in the corners of all cross-seat backs. The driver's seat is of the bucket type, and is designed especially for comfort.

General Motors Truck Company officials foresee a large market for this special passenger bus built on their new K-20 chassis. With the rapidly opening field for passenger transportation by motor



Interior view showing seating arrangement of the new K-20 type G.M.C. Motorbus

vehicle in practically every country in the world, the demand for this standardized bus—designed from the ground up especially for passenger transportation use—should fully come up to the expectations of its builders.

Motor Bus Services in Shanghai

A Comprehensive System to be Planned

MOTOR bus services are under consideration by the Shanghai municipal council.

It is pointed out in the *Municipal Gazette* that under present conditions each application for permission to run a motor omnibus service is considered on its merits without any regard to its bearing on any comprehensive motor bus system, *i.e.*, the application is considered from the point of view of the particular route concerned rather than from the point of view of such route as a component part of a bus system serving the whole settlement and municipal roads outside the settlement; and that if this policy is continued the settlement and municipal roads outside will in due course be served by a conglomeration of short route services covering only the most paying sections of roadway, since naturally the promoters of such services will pick routes that pay best and leave others alone. The result, it is suggested, will be inefficient service and intensification of present traffic congestion and difficulties, and it is submitted that it is of the utmost importance that the whole of the settlement and outside settlement roads should be carefully studied as soon as possible with a view to mapping out a definite system of motor bus routes to cover the whole and that as soon as such routes have been mapped out, publicity should be given to the fact that the council is prepared to license buses covering such routes at the licence fees stated and calling for applications.

As a preliminary a large scale plan has been prepared showing the settlement and outside settlement road system with road widths marked thereon and the complete rail and railless tram system present and contemplated also shown, and members now concur that a special meeting of the council should be held with the commissioners of police and public works in attendance and that a decision should then be reached as to the road on which the council will be prepared to allow motor buses subject always to the stipulation that no service will be permitted until the road surface is pronounced by the commissioner of public works to be suitable.

Following such meeting the commissioner of police will be called upon to prepare a schedule of bus routes designed to cover the whole of the approved roads, having regard to traffic requirements. This schedule will later be submitted to the council for approval and for the fixing of the route mile licence fee to be paid in respect of each particular route in addition to the licence fee of Tls. 100 per quarter per motor bus provided for in the licensing schedule approved at the last meeting of ratepayers.

Japan Notes

Automobiles in Japan

ACCORDING to an investigation of the department of home affairs, at the end of 1921 there were 12,117 automobiles in Japan. This is approximately only one-thousandth of the number in use in the United States, where there is one automobile for every 10.3 persons in the country.

The Japanese census of population made in September, 1920, showed a population of 55,963,053. This has naturally increased and the population at the end of 1921 is in excess of this figure. But using the census figures as a basis of calculation, there is in Japan one automobile to every 4,619 persons.

Despite the hard times of the past two years the number of cars at the end of 1921 was 2,119 greater than at the end of 1920. This is an encourging sign of the development of industry.

The greatest number of cars is in Tokyo, Osaka, Yokohama, Kobe and Kyoto follow in order of number in use. The least number is in Okinawa prefecture, the Luchu islands, where there are only 20 cars.

The Yanase Automobile Co., Ltd., has recently sold 18 Cadillac trucks to the imperial household department. It has also sold the Tokyo City Bus Co., Ltd., 100 Clydesdale trucks. These trucks are in increasing demand in Tokyo.

Tokyo municipality has bought several high-grade G.M.C. trucks, and the railway department has also ordered several 2-ton trucks.

The Kobe city bus line bought more than 700 Chevrolet cars, and the army and navy departments have been using the "Excelsior" motor-cycle more and more.

The Moji office of the imperial railways has recently begun operating motor-driven baggage trucks between the quay and the railway station, with such success that an order for a considerable number of new trucks will soon be given to an American firm.

It is reported that the station at Shimonoseki will also be equipped with these trucks.

Humber

DISCRIMINATION

AMONGST discriminating motorists the Humber is known the world over. Humber is a pioneer name and to-day stands for all that is luxurious and best in car construction. Motoring experts are unanimous in their opinions of the many sterling qualities of the Handsome Humber range.

All Humber Cars are fitted with detachable steel Artillery Wheels suitable for all climates. All open models are fitted with the Humber All-weather Hood (with side curtains opening with the doors) which provides for complete protection even in tropical rains.

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STANDARD MODELS.

11.4 h.p. 2-Seater (with double Dickey Seat)
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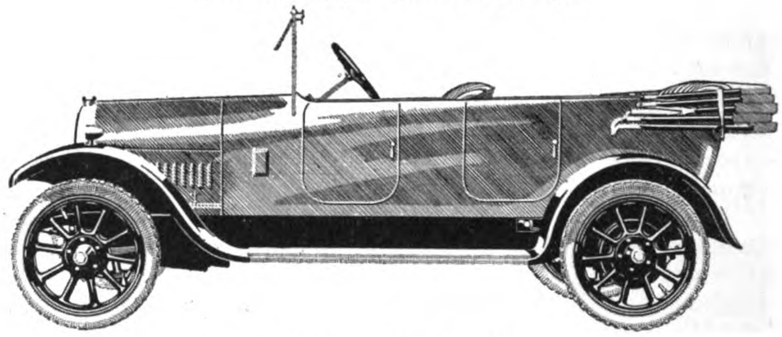
11.4 h.p. 4-Seater 15.9 h.p. 5-Seater
11.4 h.p. Saloon 15.9 h.p. Saloon



11.4 p.h. All-weather Four-Seater

HUMBER LIMITED.

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Humber House, 94 New Bond St.,
LONDON.

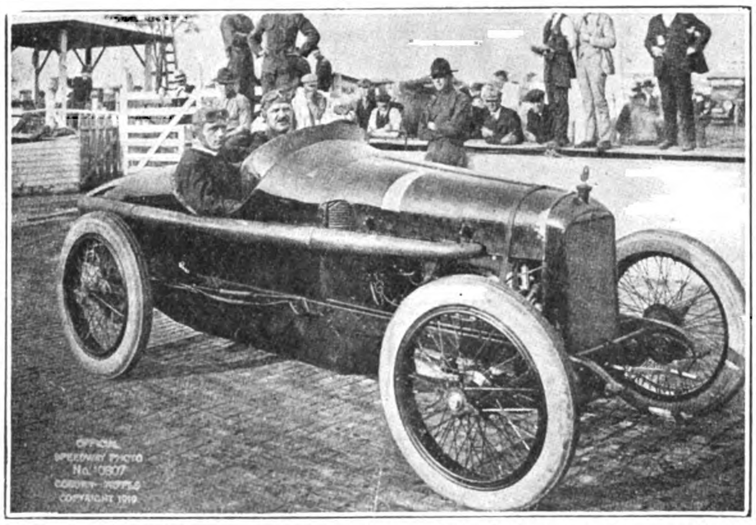
Graphite Transmission and Differential Grease No. 677

We are proud to state that No. 677 has justified the labor and expense devoted to a really intelligent effort to produce an ideal gear lubricant. It has successfully stood the test of years. There is nothing like it on the market. It is the grease the "Speed Kings" use.

No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



"Many times Dixon's Graphite Automobile Lubricants have pulled my car through a trying race without lubricating difficulty."—LOUIS CHEVROLET.

Joseph Dixon Crucible Co.

Established, 1827

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22 KIUKIANG ROAD
SHANGHAI, CHINA

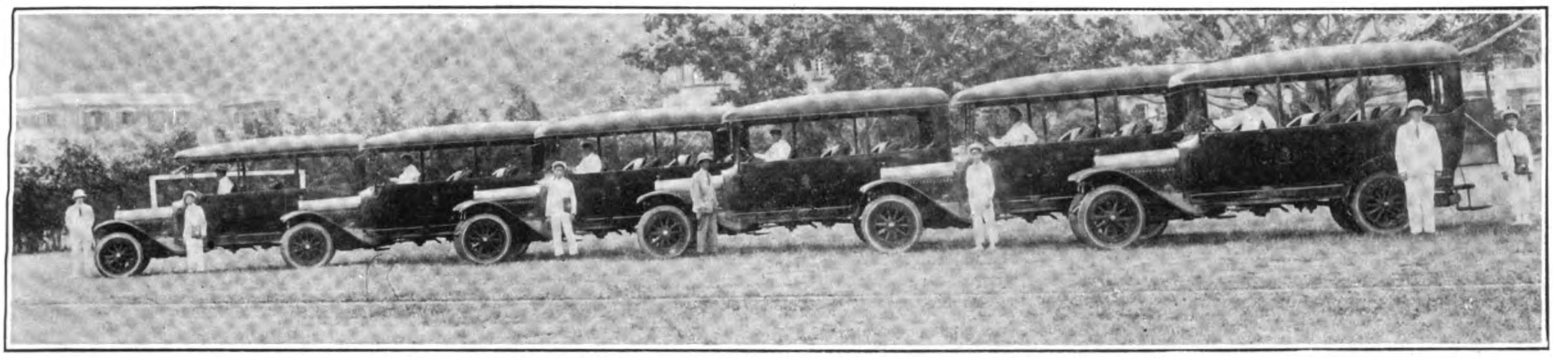
Graphite Cup Greases

Cup Greases containing fine flake graphite reduce friction to a minimum. By using these high-grade graphited greases, bearings soon acquire the well-known graphite polish that eliminates friction and causes easy running. Used in all grease cups, wheel spindles, etc.

Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

Sold in one, five and ten pound tins. Larger packages if desired.



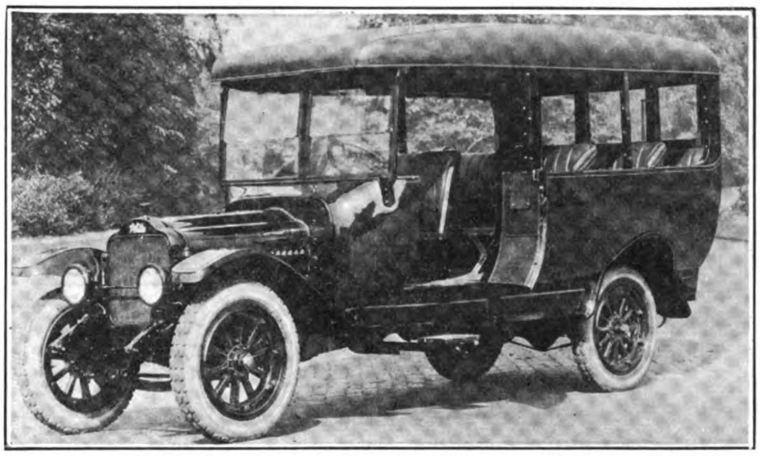
Fleet of six specially-desigued "White Buses" of the Hongkong Hotels, Ltd.

White Buses, Pride of Hongkong Hotels

EVERY visitor to the Far East wants to see Hongkong with its fine harbor, said to be one of the most beautiful in the world. This island colony of Great Britain sets in the "fragrant waters" (literal translation of the Chinese name Hongkong) at the mouth of the West River in South China.

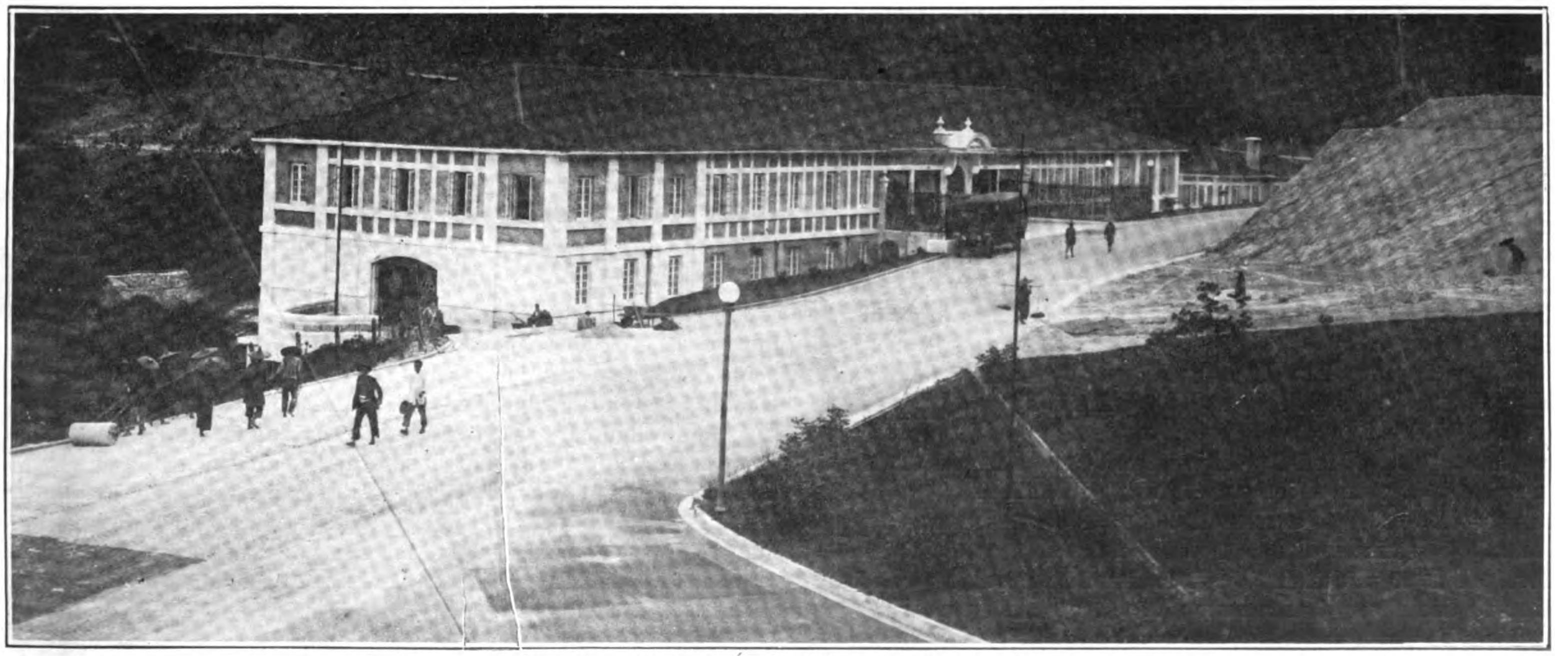
There is no other place in the East where civic improvement has gone so far as in Hongkong, particularly in the building of fine motor roads. Chief amongst the attractions of the colony is the Repulse Bay Hotel which has been built on the opposite side of the island from the city of Victoria. Known as the 'Mentone of The East' with its setting on the side of a hill overlooking the bay, it is undoubtedly the most delightful spot between San Francisco and Suez.

In order to facilitate the transportation of guests the Hongkong Hotel Company have installed a fleet of White buses which operate between the city and Repulse Bay. These buses were designed especially for this service and built by The White Company at their plant in Cleveland, Ohio, U.S.A. The specifications of the chassis conform to the latest ideas for bus work, having a fifty horse-power motor, and the correct gear ratios for negotiating the sharp curves and severe grades of the route. The body with a capacity of twelve passengers follows the design and finish of the finest touring cars. The upholstery is genuine leather. Every convenience is provided such as electric lights, bell signals, etc.



One of the Hongkong Hotels Fleet of White's

The service rendered is greatly appreciated not only by tourists, but by the residents of the colony as well. This has been indicated by the patronage given during the summer by those desiring to reach the bathing beach at Repulse Bay. The running time for the buses is the same as that of touring cars.



Hongkong Hotels' Beautiful Garage at Repulse Bay

Motor Vehicles a Prime Utility in Chosen

By Trade Commissioner William I. Irvine

NINETY per cent. of the 800 motor vehicles in Chosen are low-priced American makes, and 75 per cent. of these are used as motor busses in supplementing the railways of the country. The government recognizes the value of motor vehicles in developing the resources of Chosen ; as rapidly as roads are opened, bus lines operate over them under franchises granted by the government at fixed tariffs. Most of the remaining motor vehicles are used by missionaries—hardly more than a dozen Koreans owning cars for private use.

Practically all the roads in the country are under the supervision of the government general, which Seoul, the capital, and in Fusan, the principal seaport, are wide and unsurfaced, and during the greater part of the year permit driving without undue hardship.

Larger Market in the Near Future

The sale of motor vehicles in Chosen is at present seriously handicapped by poor business conditions ; but despite the recent imposition of heavy import duties, there are indications of an early improvement in the market as a result of the steady increase in road mileage noted above and of the more widespread recognition of the value of automotive transportation. The market is further limited by the fact that the small wealthy class of Koreans has not yet overcome the fear of showing wealth lest it mean greater taxation by the government.

As the automotive market in Chosen is gauged by the crops, the country being almost entirely agricultural, it will be limited for a number of years to motor vehicles that fall within the $1,500 margin, although the low buying power of the people is rising with the introduction of scientific methods of farming. The demand should be steady for the next few years, however, for between 200 and 400 vehicles per year to cover both new cars and replacements, the latter being based on the average four-year life of a motor vehicle under present operating conditions. There are few artificial handicaps to the sale of motor vehicles in Chosen, and the recent increase in taxes and import duties are offset by the lowering prices of American makes. Present stocks of cars bought at high prices are very small, and these, moreover, were imported under the old duties. Taxes are 120 yen per year regardless of horsepower or size, as compared with the old figure of 50 yen. Import duties are 35 per cent. on passenger cars and trucks, 25 per cent. on parts, and a flat rate of 100 yen for motor cycles, regardless of cost.

Business Practices

Dealers come into direct contact with the buyers, the chauffeur evil so prevalent in Japan not being tolerated by automotive dealers in Chosen. It is the general practice to demand cash sales with Koreans, although credit terms are sometimes given to foreigners ; the latter are usually missionaries who require cars to get over their territory. Prices are generally in keeping with laid-down costs and average about 75 per cent. above the sales price in the United States.

Dealers do not maintain separate service stations for repairs, although some carry spare parts. Repairs are made by a machine shop in Seoul, which has a fairly adequate supply of machine tools ; it is quite capable of making major repairs and, in emergencies, of making essential parts. Very little advertising is done by dealers, owing to the high rates demanded by the Japanese newspapers. Occasional announcements of new representations are made, but dealers prefer to circularize small folders. Advertising literature in English has a very limited use ; it is suggested that advertising allowances be given to dealers, on condition that it be expended on circular matter in Korean or Japanese script.

Many Dealers Inactive—Credit Terms and Shipment

The centre of motor-vehicle distribution is at Seoul, where all the dealers and repair facilities are located. At the present time there are less than a half-dozen dealers interested in the sale of motor vehicles in Chosen, although many more are supposed to be acting as representatives. American manufacturers make a mistake in granting Japanese representatives the territory of Chosen unless the Japanese company can actually prove that it is represented in the country. Only two firms with headquarters in Japan were found to be represented in Seoul. Better results will be obtained by placing Chosen on an independent basis.

Credit terms would undoubtedly have to be given in the event direct representation were placed in Chosen, as the men in that country who are interested in automotive products are limited in capital. Dealers at present are paying from 10 to 11 per cent. interest on loans. Terms granted in other lines are 90 days' sight draft, with documents delivered on acceptance.

There are no regular steamship lines giving direct service between American ports and the Korean ports of entry, Fusan and Chemulpo (Jinsen). As goods imported through Japan must pay an additional 8 per cent. duty, unless shipped in bond, it would be best to send them direct to Seoul by a bill of lading calling for transhipment at Kobe, Japan. Automotive vehicles should be carefully packed and specially braced when intended for direct shipment to Chosen, as the unloading facilities at the above ports are very bad.

Types of Motor Vehicles in Demand

The demand for passenger cars is limited to touring types, including chassis and body. Local body building is limited to special touring-bus bodies for a light popular-priced American car. The demand for trucks is chiefly for those of 1 and 1½-ton capacities, owing to the frail bridges of the country. Most of the trucks in use are owned by the government and the railroad. Merchants and minor manufacturers are beginning to use light trucks in the towns. The market for motor cycles will not increase to any extent, as former owners have found them too uncomfortable over the rather rough gravel roads and are going in for cars. The accessory market is limited to utility articles. The tire market, formerly controlled by British goods, is now in the hands of Americans ; there is a steady demand for tires and tubes, as the tires commonly last less than 3,000 miles. Dealers are advocating the use of oversize cords.

Electric Freight Cars to Supplement Motor Cars in Tokyo

Electric freight cars and non-track street cars are to be put on the Tokyo streets shortly. Fifty cars for that purpose are being built at the municipal car manufacturing works at Hamamatsu-cho, Shiba, and will be completed within this year.

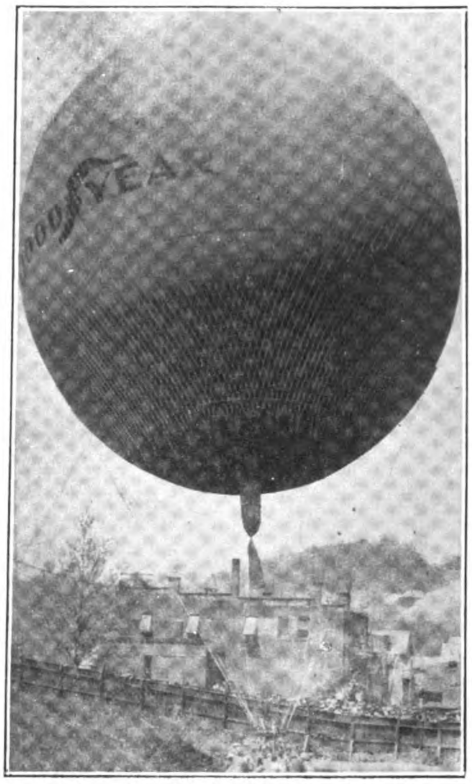
The freight cars are divided into two kinds, viz., covered, and uncovered, and each has a transportation capacity of five tons, an increase of about four tons over that of motor wagons. Fresh fish which is now being carried by ten motor vans every morning from Sumidagawa to the central fish market, can be transported by two or three electric freight cars. Moreover, the charges are lower than those of the motor vans.

The non-track street cars have rubber-tyres and the existing wire will be utilized.—*Mainichi.*

The Airship of the Future

"THE airship of the future will be of all-metal construction, which will be of fundamental assistance in the development of dirigibles for world-wide commercial use in aerial transportation" according to Herman T. Kraft, chief aeronautical engineer of the Goodyear Tire and Rubber Company.

Two factors must be considered above all others in the construction of airships of any kind, namely safety and durability. There must be absolute protection against structural failures as well as against fires. As long as airships are constructed of inflammable materials, there will always be some danger of fire, especially with the use of hydrogen gas.



300 cu. ft. Goodyear Free Balloon

Uniform distribution of strength, which is the major basis of safety, is exceedingly difficult to obtain even in a rigid airship because of the very complicated calculations necessary to be sure of safety, since we have to figure unknown factors and allow for them in every airship we build. It will be possible with an all-metal ship to make those calculations much more exact than has hitherto been possible, due to the reduction of the number of small riveted parts which have formerly been multitudinous.

The entire surface of the ship will be of metal, thereby assuring greater durability and reduction of fire hazard. Tests have been made which indicate that even hydrogen ignited on the surface of an all-metal container will burn freely without heating up the metal, so that there would be no danger of the envelope being consumed by the flame.

Unquestionably the building of such a ship would be a mammoth undertaking, but with the present engineering knowledge available its construction would be entirely practicable. Indeed it has been attempted before, so far back as two decades ago, and flights were actually made with an all-metal ship with conical ends and cylindrical body, but the ship was not a success, chiefly because engineering knowledge had not progressed sufficiently in aeronautic, and proper construction materials were not available.

Aluminium sheeting would doubtless be the metal employed with strips of very flexible non-inflammable material or wire lacing interpose at various points to take care of the flexing of the envelope while in flight.

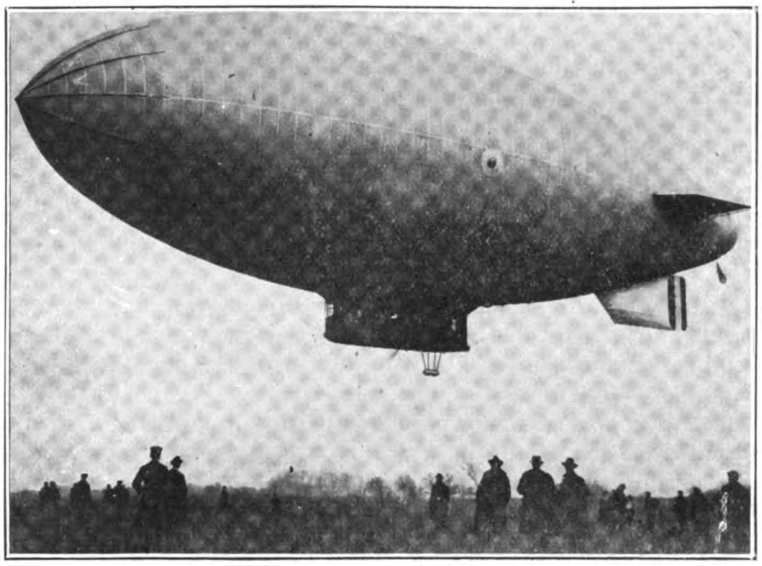
Approximately 1,000,000 cubic feet capacity, with a theoretical length of 350-ft. and a maximum diameter of about 75-ft., would be the proper size of ship to make to prove its practicability.

In any consideration of all-metal ships, the question of gas-tight seams has generally been a bugbear, but it has now been conclusively proven that the seams in such a ship can be made gas-tight, especially in a container carrying low pressures.

The actual building would be somewhat of a problem even in the modern workshops and hangars of the Goodyear company, but by using airbags to keep lifting the ship progressively while under construction, and erecting superstructures in the hangars the riveting, lacing and assembling could easily be handled.

The rigidity of the structure which would have some degree of flexibility, would eliminate many of the structural difficulties in rigid airships of the present design.

The first practical all-metal ship will be the key which opens the gates, hitherto barred because of lack of positive assurance of safety and durability, to a real commercial use of the dirigible in air transportation. A striking characteristic of our day is the rapidity



Latest Goodyear Blimp

with which people accept the marvellous inventions which but yesterday seemed to be the delusions of cranks. We have long ceased to wonder at radio and accept without question every news story of its possibilities. There is every indication that it will be the same with aeronautics, with the advent of the first practical all-metal airship, which can be assembled with greater speed and less cost than ships of the Zeppelin type. Undoubtedly a ship of the construction features pointed out, would practically abolish the dangers from fire and structural breaks, and have all the safety of a modern ocean liner.

Failing to obtain the necessary grant for the development of her air service, Siam is holding a million tical lottery as an alternative method of getting things aerial going. Fifty thousand pounds will be distributed in prize money, and the air service will benefit by the same amount. The first prize will be £10,000.

Siam's air force consists of 115 airplanes and a staff of 650. There are five airdromes and 25 prepared landing places in the country.—*Flight.*

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Manchuria Railway

Operating economies enabled the South Manchuria Railway to report net profits of Y.31,386,000 ($15,693,000) for the year ended March 31, or an increase of Y.3,990,000 as compared with the preceding year. The road's gross earnings totaled Y.147,100,000 and expenditures Y.115,714,000. The Chosen line showed a profit of Y.606,000 as against a loss of Y.1,070,000 in the previous year. Half of those profits go to the South Manchuria Railway.

During the year the company expended Y.45,000,000 in improvements. On new equipment and extension of double tracking Y.14,000,000 was disbursed; wharves, Y.4,000,000; mining properties, Y.10,000,000; barges and tugboats, Y.910,000; steel mills, Y.1,310,000; electrical enterprises, Y.3,000,000; gas plant, Y.500,000.

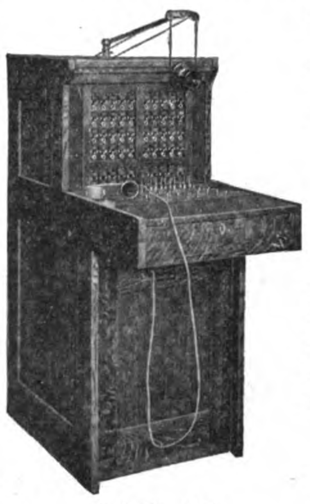
The directors authorized the regular 10 per cent. dividend to public shareholders.

More than fifty cars of different nationalities took part in the speed tests held by the Automobile Club of Sweden at Jonkoping. Good results were obtained in the hill climb, particularly by the small cars. The fastest of these was a 1460 c.c Fiat driven by Gisiko, who beat all comers, the second in the same class being Stuernsward on a similar machine. Ohlsson on a 3970 cc. Voisin was third, followed by Andresenz on a 2930 c.c Essex, Eklund on a 3970 cc. Voisin and Widner on a 2550 cc. N.A G.

The following are the official results :—

Class 1. Fiat, Gisiko; Fiat, Stuernsward.
Class 2. N.A.G., Widner; Overland, Wiken.
Class 3. Essex, Andresenz; Buick, Nas.
Class 4. Stephens, Fogelqvist; Steyr, Melter.
Class 5. Voisin, Ohlsson; Voisin, Eklund.
Class 6. Lancia, Brambeck; Cadillac, Wiessner.
Class 7. Packard, Gislow; Hispano-Suiza, Fraenkel.

Kellogg Magneto Switchboards for Profitable Operating



Code No. 11 B

1 Generator Circuit.
1 Night Alarm.

No. 11 B—50 line capacity, wired as follows:
50 lines, combined drops and jacks (5 per strip) as specified.
8 cord circuits, single or double supervision with or without repeating coils, as specified.
1 operator's set, suspended or breast plate type transmitter as specified.
1 Generator Circuit.
1 Night Alarm.

No. 12 B—100 line capacity, wired as follows:
100 lines, combined drops and jacks (10 per strip) as specified.
12 cord circuits single or double supervision with or without repeating coils, as specified.
1 operator's set, suspended or breast plate type, transmitter as specified.

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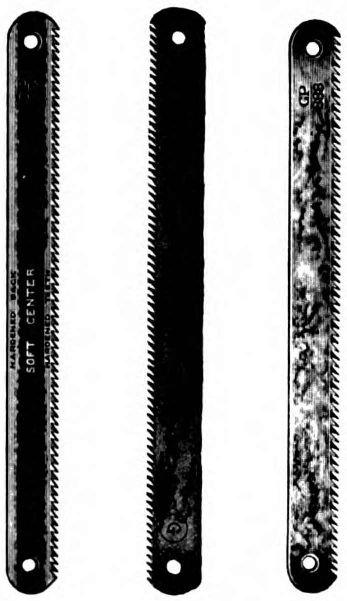
1500 GOOD TOOLS



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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

FACING THE FACTS

ELECTRICAL DEVELOPMENT IN JAPAN

YANGTZE RIVER BRIDGE

LAND OF THE ROKO

INDO-CHINA

OIL FIELDS OF THE N. E. I.

POWDERED COAL

Vol. XVIII December, 1922 No. 12

SHANGHAI, PEKING, TOKYO AND MANILA

Some Outstanding Features of the Walworth Complete Line for Oil Fields and Refineries

FIG. W2621
IRON BODY GATE VALVE

FIG. W4104

ALL WALWORTH QUALITY

FIG. W1323
HYDRAULIC FITTING

Standard Malleable Fittings and Nipples, Extra Heavy Cast Iron Fittings, Hydraulic Steel Fittings, "Kewanee", National and Oil Country Flange Unions, Power Plant Material of all Kinds.

"Genuine Walworth Stillson" and Reversible Bostong Pipe Wrenches, Standard Globe, Angle and Check Brass Gate Valves, Standard and Extra Heavy Iron Body Gate Valves with Non-Rising Stem. Extra Heavy Iron Cocks.

FIG. W3782
IRON COCK

FIG. W4225
WALWORTH REVERSIBLE BOSTONG

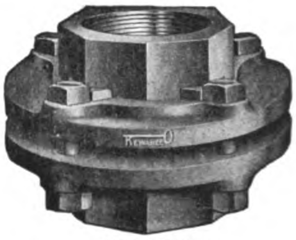

FIG. W2351
"KEWANEE" FLANGE UNION

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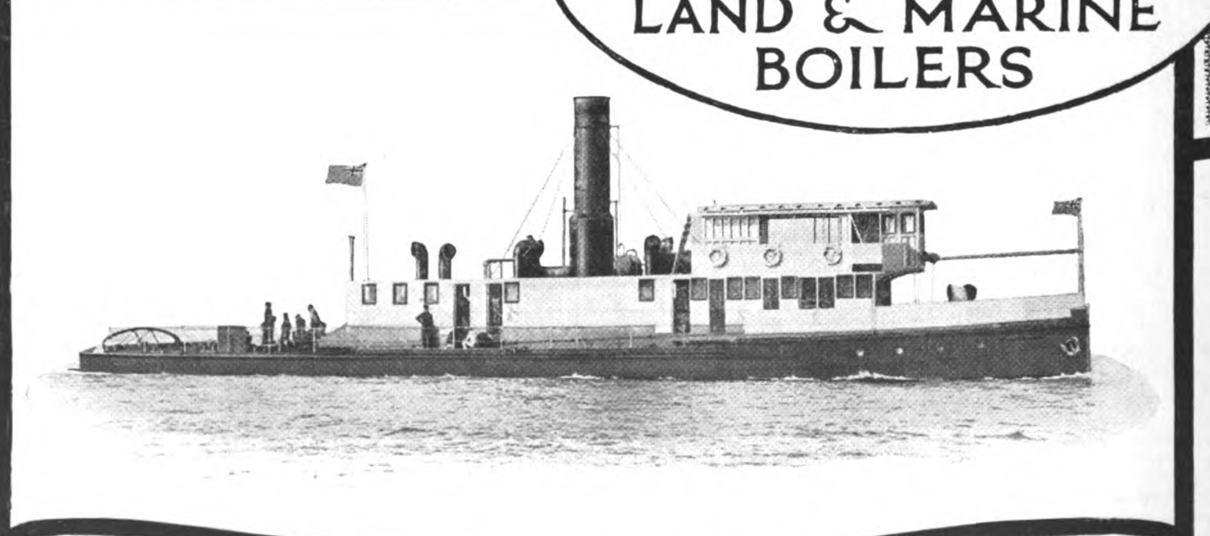


The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, DECEMBER, 1922 No. 12

FACING THE FACTS

From the September Issue of THE FAR EASTERN REVIEW

"If we wait another ten months or a year for the parliament to draft a constitution and Wu Pei-fu to settle his score with Chang Tso-lin, the control of China will have passed out of the hands of the *tuchuns* into those of the bandit chiefs. As the mandarins gave way to the militarists, the latter will give way to the bandit leaders. Over 40,000 so-called bandits are ravaging the province of Shensi, while the provinces of Honan, Anhuei and Shantung are overrun with these gentry, to say nothing of the chronic situation in Manchuria, where the Hunghutzes defy Chang Tso-lin to suppress them. In fact, nearly every province is overrun with these bands preying upon the helpless people. Towns are burnt and sacked, women torn from their homes, and men pressed into the service of the bands. Foreigners are siezed and held for ransom, and even the son of the redoubtable Christian General Feng was kidnapped from under his father's protecting wing on a recent trip to Kueiteh. The situation in Manchuria goes from bad to worse. Within the past few months several attempts have been made to interfere with the South Manchuria Railway, and recently the rail fastenings were loosened and the express wrecked. There is a limit to such practices. The forces of Wu Pei-fu, Chang Tso-lin and other military chieftains are helpless before the bandit rule. Any serious attempt to eradicate these bands only result in their augmentation by the desertion of the uniformed troops sent to suppress them. This is ANARCHY. This is CHINA. The foreign powers can prolong the situation and make matters worse by financing any one faction, they can advance sums to Peking in order that parliament, the "salary demanders union" and hordes of officials can be sure of their pay for ten months more, but at the present rate of progress, when that time expires, the white wolves of China will rule the country. The foreigner will again be asked to furnish the funds to restore order. A vicious circle. Stop it now."

THE "White Wolves" of China are slowly but surely overthrowing the last vestige of organized government and taking over control of the country. An orgy of rape, murder and destruction is now taking place in Central China. Cities, towns, villages and hamlets are looted, burned and razed to the ground; the fairest women carried off to slake the lust of the brigands. Merchants and officials are abducted and held for ransom. Foreigners are no longer exempt from capture and death, and as each crime goes unpunished the operations of the bandits become bolder and bolder, until now there is no security for life, liberty, honor or property for the foreigner who resides or travels through the provinces of Honan, Hunan, Anhwei and adjacent districts.

Where will it end? The legations in Peking seem powerless to find or suggest a solution. The policy of non-interference in the internal affairs of other countries is being scrupulously adhered to, and while the subjects of all nations cry out for protection their voices are drowned in the welter of sentimental propaganda which floods the newspapers of Europe and America. The Peking government is admittedly powerless to enforce law and order. Government has ceased to exist. Only the Waichiaopu and the loan-seeking officials of the ministry of finance provide evidence of any semblance of government in Peking. They are very active, so active in fact, that their activities overshadow the real events transpiring in the provinces.

The puppet show in Peking is unable to provide protection to life and property, in fact, it cannot even guarantee its own salaries. The masses of China are impotent before the hordes of militarists whose rabble armies are eating up their sustenance. The militarists in turn are now powerless before the increasing activities of the numerous bandit hordes, composed in large part of their own unpaid soldiers. As it is in Honan, right under the nose of General Wu Pei-fu, so it is in Hunan, in Anhwei, in Fukien, in Kwantung, in Kwangsi, in Szechuan, in Shensi, in Shantung and in the Three Eastern Provinces known as Manchuria.

For some years past, the apologists for crime and outlawry in Manchuria, Shantung and other parts of China, have succeeded in convincing the outside world that Japan was at the bottom of these disturbances. *There are no Japanese adventurers in Honan, Anhwei, Hunan or Szechuan.* There may be some in Manchuria, but banditry has been endemic in that section of China for a century

or more. Long before the Japanese set foot in Manchuria, it was an outlaw's paradise. The evidence of every traveler who explored the province before it was opened to trade corroborates this statement. When James and Younghusband traveled through the province in 1885 the bandits were as active as they are now, and ten years later when Hosie passed through on an official mission, his party was attacked. Hosie is authority for the statement that about a thousand bandits were beheaded yearly at the provincial capital of Kirin. *All this before the Japanese came into Manchuria.*

It has been the same in all other remote provinces of China. The home of piracy for centuries has been the China coast and the Canton delta, while the frontiers of Indo-China have provided hair-raising episodes that put in the shade all the diabolical deeds of outlawry in other countries.

The reports of the commissioners of customs for the Kwangsi and Kwangtung districts read more like 17th century tales of Captain Kidd than the prosaic recording of trade movements. When the bandit hordes in Manchuria and Shantung swoop down upon and loot and destroy towns and villages, there are always apologists to be found who hasten to ascribe their depredations to the machinations of the Japanese, but when the same gentry in Kwangsi, capture a French soldier, tie him to a table and skin him alive, the episode is passed over and forgotten. The truth must be faced that brigandage and outlawry in certain sections of China are endemic, the natural sequence to the failure of the authorities to enforce respect for the law. Now that government has ceased to exist in China, it is not at all surprising that the activities of these desperadoes are becoming bolder, and that for all practical purposes they are now the real rulers of the land. At the rate lawlessness is spreading in China, it will not be long before foreign settlements will be unsafe to live in, and unless measures are immediately adopted to insure protection, another six months will chronicle events that will call for international intervention.

The picture is not overdrawn, if anything it minimizes the situation. At various times when the Japanese government protested against the bandit activities in Manchuria and along the Korean border line, the foreign community in China has withheld sympathetic support, and when Japan, taking the law in her own hands, has despatched her troops into the disturbed districts, the howl of indignant protests re-echoed around the world. The shoe is now on the other foot. The orgy of rape, murder and destruction in Central China has at last provoked a forceful protest from the foreign residents of Hankow and the powers asked to intervene. This comes after a year of silent acquiesence on the part of the powers to the depredations of the bandits and military in the upper Yangtze and Central China districts. Travel on the Yangtze has been unsafe for over a year. Peaceful steamers with their freight of passengers have been fired upon; held up, robbed and otherwise interfered with. Now foreigners are dragged about the country as captives to the bandit hordes and placed on the firing line to ward off pursuit.

Space alone prevents us from reproducing in full the harrowing tales embraced in the speeches of protest against the bandit outrages at the meeting of the international chamber of commerce of Hankow held on November 15. This time the evidence comes largely from the missionaries, and it is to be hoped that their influence in Washington and London will compel that attention to the situation which could not be attained by commercial protests. In the words of the *Shanghai Times*, "*in any review of the brigand situation in Honan, brief though it be, it is impossible to enter into details and tell about the scores of bands which have been terrorizing nearly all parts of the province, devastating the country, burning and looting villages, market towns and even some cities, extorting money by torture, raping women and holding men and women for ransom. The details of this story would fill volumes. These bands are roving about the country, looting city after city, interfering with the flow of foreign trade, robbing mission stations, carrying off French, British and American nationals, among them even little children, dragging them from place to place, and even placing them upon the firing line, when as sometimes happens, there is an engagement between brigands and soldiers. One's blood boils on reading the terrible record of devastated territory, shameful indignities, burning towns and ravished women. And in face of all this, the authorities remain singularly apathetic and occasionally, prodded by diplomatic protests, are moved to send mild remonstrances to the tuchun of the province concerned.*"

Under the title of "Disorder in China, a Description of Conditions in some of the Chief Trading Areas of China," the November number of the British Chamber of Commerce *Journal* also places the facts before the reader.

It shows that, instead of the chief trading areas in China offering the rosiest prospects to the business man, they are really the happy hunting grounds of native robbers into which, if he ventures, he is more likely so lose what he has than to gain anything. The writer begins in the North and takes up the trading areas province by province. Of Manchuria he says: "Traveling has become unsafe off the principal main roads throughout the whole province. Many towns in the interior, which in previous years have been annually visited by the foreign travelers of the oil and tobacco firms, have been out of bounds this year." "In the Kirin province brigandage has been very bad, and little or nothing has been done by the provincial authorities to cope with it. Wulichieh, a very wealthy village only 20 miles from Kirin city, was attacked in the middle of September by a band who thoroughly looted the place killing in the process a large number of the inhabitants. This was only one of many similar outrages." Of Shantung it is said: "The Chiaotung circuit is still unsafe to travel and likely to remain so." In Shensi the story is: "Brigandage appears to be rife throughout the whole province, especially in the western districts. So many people have been kidnapped and held for ransom that the governor has sent his own family to Taiyuanfu in Shansi for safety." The story of Honan is given, but of that we have had more than enough of late. From Chungking the report comes that: "As a result of the recent military operations, brigandage has seriously increased. Towns and villages have been attacked and weathy residents held to ransom. Parts of the southeastern district are said to be practically depopulated, the rural population having sought refuge in the towns." From Chengtu the news is: "Brigandage is as rampant as ever. In parts of the province gangs of starving people have been raiding the houses of the rich. Cain Lung Chang, a small village only two miles outside the north gate of Chengtu, was completely cleaned out house by house."

In commenting on the above, the *Central China Post*, one of the best informed authorities on conditions in the interior, says "the above investigation was apparently not extended to such provinces as Hunan, Kiangsi, Fukien, Kwantung and Kwangsi, or the picture would have been blacker still. Such is China in the present year of grace: will the Home press please take note. It is indeed very wearisome, and rather annoying, to find China so frequently set up as an object of admiration that it is hard to have patience with it."

Unchecked lawlessness can have only one result. When cities within a few hours march of the headquarters of the redoubtable General Wu Pei-fu are sacked and ravished and no effort is made to round up the culprits, and when life is placed in jeopardy once the foreigner steps outside the Japanese railway zone in Manchuria and comes under the jurisdiction of the equally redoubtable Marshal Chang Tso-lin, and when travel becomes unsafe for foreigners in all other parts of China, we are rapidly approaching the time, when conscious of their immunity from chastisement, the Real Rulers of China, will extend the scope of their operations to the more opulent treaty ports.

I. MANCHURIA

The Powder Magazine

By Geo. Bronson Rea

"Kemal Pasha overthrew the treaty ef Sevres and defied the allies in Europe. It may be that Japan, to protect her vital interests, will be compelled to follow his example, in order to preserve the integrity of China and the peace of the Far East."

ENCOURAGED and supported by the Soviet and Germany, Kemal Pasha brought Europe face to face with the horrors of another upheaval in the Balkans. The firm stand of Great Britain alone checked the onward march of the victorious Turks and thwarted for the time being the designs of Moscow. The Turkish victory was hailed throughout Asia as a sign that Asiatics may yet come into their own through the dissentions of Europe. Checked for the moment in the Near East and true to traditional Muscovite tactics, the Soviet shifted the scene of operations to the next weakest point in Great Britain's armor, and is now creating a situation in Eastern Asia rapidly developing to the point where Japan will be called upon to take some decisive step in order to protect her vital interests against the progressive advance of Bolchevism into regions where their presence and influence can only result in complicating an already complex situation and precipitating a crisis. We cannot apply one principle in Europe and America for the protection of fundamental policies and deny the right of a strong power in Asia to apply the same principles where its very existence is at stake. If the British are upheld by world opinion in such firm measures for the defense of a basic strategic policy. and the United States is justified in applying the Monroe Doctrine, then the time is past when the world may condemn Japan for applying similar measures for the defense of her national existence,

Forced by the pressure of world opinion and united diplomatic action to recede step by step from advantageous strategic positions in Eastern Asia, until she can do so no further with dignity or safety, will military Japan emulate the example of Kemal Pasha ? Or, if this comparison be distasteful, will a liberal Japanese cabinet follow the lead of its British counterpart and break the understandings which fetter its independent action in defending the existence of the empire ? Will the consortium powers who have so emphatically laid down the fundamental law in regard to China's integrity, unite in support of the principles they established ? Will they uphold the integrity of China ? Will they send their troops into Manchuria to give effect to the doctrine that Mongolia is an integral and most important province of the republic of China ? Will they demand in the name of world peace that China immediately put her house in order and comply with her international obligations by driving the Russians out of Mongolia, or, will they wait until Japan, like England, is compelled by the stern realities of the situation to adopt measures for the defense of policies which are as dear to her, if not dearer, than those which the world applauds when appealed to by Great Britain as justification for her recent stand at Constantinople, and those which every American, no matter what his creed, will fight at the drop of the hat to maintain ?

Living up faithfully to her promises and pledges, Japan has returned Shantung to China, evacuated Siberia, withdrawn her forces from Hankow and northern Manchuria and reduced her garrisons in the southern part of the same province. She has fulfilled her agreement with the United States to clear out of Russian territory. Her government now faces the world with a clear conscience. The slate is wiped clean.

In the consortium negotiations which followed the Paris conference, certain very important principles were established. These negotiations centered upon the inclusion or exclusion of the Taonan-Jehol line into the international pool. Never perhaps in the history of diplomacy was such disregard given to the strategic policies of an ally by powers who would have fought to a finish before sacrificing similar doctrines evolved for their own defense. Never, perhaps, in the history of diplomacy has a friendly nation been so hard pushed as to be compelled to forsake the usages of diplomacy and explain her policies in language that left nothing the imagination. Japan's diplomats were finally forced to tell her allies that her claims to the Taonan-Jehol line were based primarily on strategic reasons for the mutual defense of China and Japan against "the menace from the direction of Urga." The powers, who have a very long memory where their own vital policies are concerned, were attacked with aphasia when asked to consider Japan's position. They forgot that the Taonan-Jehol railway rights were secured from China in 1912, immediately after Russia had taken over Mongolia and was moving heaven and earth to raise the loans in Paris to build the strategic railways that would enable her armies to attack Japan on her unprotected flank. The powers ignored the history of those terrible years following the peace of Portsmouth, when Japan was compelled to add to her staggering burden of taxation in order to arm and equip new battalions and keep abreast of Russia's gigantic plans and secret manœuvres to renew the conflict. This, Witte assures us, was to have occurred in 1912.

Japan's position in Eastern Asia differed in no wise from that of her allies in Europe, who forced through a difficult peace and broke up the German, Austrian, Russian and Turkish empires in order to create buffer states to guarantee them from the possible revenge of a vindictive enemy. These same powers, after carefully protecting themselves for the next quarter century, rejected the claims of Japan to erect similar defenses against the possible come-back of her traditional enemy. Principles that applied in Europe did not apply in Asia. The American and British press pooh poohed the idea of a reorganized Russia, when Japan put forward her reasons for maintaining certain policies in Eastern Asia. The same diplomats who calmly carved European Russia into new states for their own purposes, took over the self-imposed task of defending her integrity in Asia in order to check Japan. Japan could not be permitted to retain her rights to a strategic railway that would defend her from attack through Mongolia. After receiving assur-

ances, however, that her vital interests would never be placed in jeopardy through the activities of the consortium, Japan swallowed her disappointment and accepted the verdict which condemned her at no distant date to again stake her independence on the outcome of a trial of strength on the plains of Manchuria.

The concerted pressure of the powers upon Japan to compel her to relinquish the rights to a railway which constituted her first line of defense, will stand as one of the greatest in consistencies of recent history, the misguided move that is bound to bring its own reward. The very statesman, who as viceroy of India, declared that " the recognition by any power of Russia's right to a port on the Persian Gulf would be regarded as a deliberate insult to Great Britain, an intentional provocation to war," as secretary of state for foreign affairs in 1920, was the first to deny to Japan to right to apply a similar policy in Eastern Asia when the latter's national existence was placed in jeopardy through the forward moves of Russia. The American president who declined to permit the Monroe doctrine to be vitiated by the league of nations, rejected Japan's rights to maintain a policy calculated to ward off the attack of her most formidable enemy. It was a wonderful victory for western diplomacy. It is more wonderful still that Japan in order to preserve world peace, sacrificed her strategic position and accepted the doctrines laid down by her partners. As we scan the situation in Europe, we see no evidence that any other great power is willing to forego any of the advantages that has come to them as a result of the war. Japan stands alone, the one great military nation that has consented in the interests of world peace to surrender a vital policy.

At the Washington conference her position was again clearly set forth. Japan waived all claims to special rights in China, withdrew her twenty-one demands and whole-heartedly acquiesced in all proposals for the restoration of China's impaired sovereign rights. She made just one reservation. Japan declined to discuss or consider any proposition that might tend to weaken her position in South Manchuria. Even in this, it was with no intention of ignoring the sovereignty of China, or pushing forward aggressive designs. China was admittedly unable to guarantee her neutrality in these regions and with the ever present prospect of Russia returning once more to Harbin and Changchun, Japan had no option but to insist on the recognition of her position in Kwantung. Her position was identical with that set forth by Mr. Balfour in explanation of Great Britain's retention of the Kowloon territory, one purely strategical in its nature forced upon Great Britain because of China's weakness and inability to provide guarantees that a hostile army would not take possession of the Kowloon hills and bombard Hongkong from the land side. Japan stood firmly on the same argument, but with greater justification.

This was Japan's dead line in her concessions to China and world opinion. The Americans, British and French delegations fully understood Japan's unalterable termination to retain the strategic advantages gained as the result of the terrible sacrifice of 1905. In fact, it may be said that the Americans had full cognizance in advance of the Washington conference of Japan's emphatic refusal to consider or discuss any proposals which might in any way refer to her position in Manchuria. It was the recognition of this and Japan's similar acceptance of basic American policies which made the Washington conference possible. This understanding, we have reason to believe, was the direct outcome of General Wood's visit to Tokyo four months before the opening of the conference, when strong men sat opposite each other and indulged in a heart to heart talk. The gist of that frank discussion conveyed to the military leaders of Japan that any attempt on their part to fortify the chain of islands encircling the eastern Asiatic coast that might, under given circumstances, prevent access of American vessels to the Chinese markets, would be considered as sufficient justification for the United States going to war. On the other hand, the Japanese leaders conveyed in similar emphatic language to the American general that any attempt to interfere with their vital policies in Manchuria would reluctantly force Japan to fight. The irreducible minimum of each other's policies was frankly set forth and the way paved for the diplomats to discuss details and side issues at Washington. Japan would have rejected an invitation to any conference that embraced in its agenda a discussion of her position in Manchuria. This basic fact, recognized by the American leaders, made the Washington conference a success.

Japan has since lived up to her promises. She has relied upon the pledges of her partners in the consortium to respect her vital policies in Manchuria. She willingly consented to a limitation of armaments after the preliminary basic understanding with the United States was arrived at. In every way Japan has since endeavored to prove her pacific intentions. At every step she has receded, the Soviet has moved forward and taken her place. The powers have acquiesced in the Soviet occupation of Mongolia and pressure is now being exerted upon Japan to evacuate the northern half of Saghalien.

With Japan's power for defense undermined by treaties and understandings, the one obstruction to the rapid spread of Bolchevism in Eastern Asia has been removed. The powers, in a fit of jealousy, rejected the right of Japan and China to come together in a military alliance for the defense of their mutual interests in Mongolia and Manchuria and paved the way for the reds to re-enter Urga, extend their authority to Vladivostok and take over the Chinese Eastern Railway. A red force of ten thousand men now occupies Urga with at least 30,000 encamped somewhere in the vicinity of the Mongolian borders. Vladivostok has been handed over to Moscow. The Far Eastern republic has ceased to exist. The refugee whites, left to their fate, are swarming into Korea and Manchuria. The reds control the Siberian railway with their troops quartered at Pogranichnaya on the east and Manchuli on the west. It will not be long before they will take possession of the Chinese Eastern Railway and assume jurisdiction over the railway zone. We will return once more to the strategic situation existing in 1914, with Harbin as the Far Eastern military headquarters of the Russian army and confronting Japan at Changchun. With the red armies in Urga and strung along the Mongolian border lands and Japan hamstrung in the Taonan-Jehol zone, northern Manchuria will once more be lost to China. If Japan recedes one inch in south Manchuria the Soviet will take advantage of China's weakness and advance into the vacated position. This, therefore, is the situation, the world must face in the Far East. Once more the armies of Nippon will be watching the moves of Russia across the narrow strip which separates the northern and southern Manchuria military zones. The situation is loaded with dynamite with the fuses and red flags of danger in place waiting for the traditional humorist who doesn't know the thing is loaded, to playfully close the circuit.

Applying the Match

At this juncture, when the situation is becoming tense, when the Soviet is seeking to break the power of the allies in Europe and extend its influence in Asia, the Chinese seem determined to call upon Japan to evacuate the Kwantung leased territory in March of next year. At a time when China has disintegrated into several independent feudal states ; when its so-called central government exists in name only and by courtesy of the foreign powers ; when unpaid hordes of disbanded or deserting soldiery uniting with the always present bandit bands and pirate crews defy even the armies of the tuchun oligarchies and carry their depredations into treaty ports and attack foreign shipping ; with the treasury a tradition, almost a myth, the vaults empty and the government bankrupt, defaulting on its internal and foreign loans and current obligations ; with the salaries of officials months in arrears and the unpaid organized into salary demander's unions ; with the Soviet in Urga boldly annexing Mongolia and the red plenipotentiary telling the Chinese they are there to stay ; in the face of the most tremendous

crisis in Europe and Asia, powerless to enforce national rights or inspire respect, the Chinese minister of foreign affairs, backed by politicians playing to the gallery and encouraged by foreign advisers who have nothing to lose, selects this moment in which to re-open one of the most delicate questions in Far Eastern history, one, which, if answered according to their desires, would once more bring the Russians to the banks of the Yalu and force Japan to battle for her existence.

It would appear that the present is hardly the time to discuss the pros and cons of the validity of the Manchurian treaty signed as the outcome of the twenty-one demands, and it is certain that if the Chinese foreign office insists upon raising the issue and officially notifies the Japanese minister that the treaty has been declared null and void, a most serious situation will be created. From all present indications, Japan will refuse to disuss the matter. China will then have to take the next step, make good her stand, or be humiliated.

The annulation of a treaty under such circumstances must be supported by force. If China insists upon declaring the Manchurian treaty null and void and Japan refuses to discuss the matter, the situation so created will automatically cause a severance of diplomatic relations, and if a move is made by China to enforce her position, the fat will be in the fire.

China perhaps, has a sentimental case, but appealing as it is, Japan has a strong counter argument. In presenting her claims to the world, China must be prepared to go behind the twenty-one demands and explain her part in the secret diplomacy of 1895 which brought Russia into Manchuria and forced Japan into one of the most disastrous wars of history. China has justly complained of secret diplomacy where her own interests have been bartered away without her knowledge and Americans at least, have sympathized with her, but she must now face the facts in regard to the secret treaties and understandings which made her an ally of Russia, and under whose provisions Manchuria was converted into the base for Russia's attack upon Japan. As far as can be seen to date, China rests her case on the fact that the Manchurian treaty was extracted under compulsion as a result of the twenty-one demands. If the revelations of Sazanoff at the Paris peace conference and the confessions of Count Witte be ignored, China is in a very strong position, but if we accept the facts disclosed by these two Russian statesmen, China will have to explain her part in a secret alliance which forced Japan to make such terrible sacrifices in 1905. It may well be, that Japan, if forced, may also go behind the twenty-one demands and in the light of evidence which makes China an accessory to the war of 1905, demand compensation for the part she took in bringing about hostilities.

Chinese authorities declare, that the secret Li-Lobanoff alliance was vitiated in 1900 by the action of Russia, that China was not responsible for what happened after that date, but, on the other hand, there is public no record that the treaty was officially denounced, and it is also true, as far as Japan is concerned, that the damage was done previously to that date by handing over Manchuria and the Kwantung territory to Russia in compliance with the object and aims of the alliance. Japan, as yet, has never raised the question of China's part in bringing about the war with Russia. She fought the latter and restored to China her sovereignty over Manchuria, which the Russians had determined to create into another Bokhara, closed to foreign trade and travel. Instead of being called upou to indemnify Japan for her part in an alliance which precipitated the war, China escaped scot free, and even had her provinces returned to her, the first and only instance we are aware of where such magnanimity on the part of a victor is recorded. China escaped paying the penalty for her double dealing by reason of the diplomacy which maintained the existence of the treaty of alliance a profound secret until 1919.

New facts call for a reconsideration of all cases, whether with nations or individuals. Judgement has often been reversed and the original verdict set aside after a lapse of years by the disclosure of new evidence. This has a special bearing on the much discussed Manchurian question, and it was the revelation of this new evidence in 1919 which modified our own views on basic Far Eastern problems. The publisher of The Far Eastern Review carried the brunt of the newspaper campaign in the United States in 1915 against the pretenses of Japan in the twenty-one demands, and it was admittedly due to these labors that the American government placed on record in its memorable note of May 15 of that year, its refusal to recognize any treaties which might in any way impair the rights of American citizens in China or the principle commonly known as the "open door" principle. We fought that campaign for China in complete ignorance of vital facts bearing on the Manchurian situation. We have never reversed our opinions, however, on other matters, and have strongly urged the Japanese at all times to return Shantung to China at the earliest opportunity, withdraw their troops from Hankow and in every way prove by actions the sincerity of their friendly professions towards their weaker neighbor. At the time we acted as " counsel for the defense " of China's case in 1915, the existence of the Li-Lobanoff treaty was still a profound secret. Once the text of that document was revealed at Paris it compelled a complete modification of established views, and explains in part, why, since that time, we have been unable to conscientiously support a secret diplomacy which compelled Japan to pay such a terrible price.

We have explained these matters fully in previous articles and quoted Count Witte at length in support of our views, but to date the majority of Far Eastern experts have preferred to ignore the importance of these revelations or their bearing on fundamental problems. No Chinese or American writer has commented on a document upon which is built the history of the Far East since 1895, and we have reason to believe that it was our own repeated references to its existence, that finally called forth at Washington an official acknowledgement of its text by the Chinese delegation, at the call of Mr. Hughes for the filing of secret treaties. We were quick to see in Paris that the facts surrounding this alliance completely undermined American policy in China, and placed John Hay in the position of advocating a doctrine based on the recognition of China's sovereignty, after the latter had willingly handed over and impaired her integrity in order to be revenged upon Japan. A policy that could not and did not preserve Japan from attack by Russia through the territories of the nation the policy was created to benefit, is, on analysis, no policy at all, but a mistake due to secret diplomacy, that worked out to the advantage of Russia.

The importance of this document, tardily acknowledged by the Chinese delegation at Washington, seems to have been lost even in subsequent discussions on Far Eastern problems. It was only recently, that the adviser to the president of the republic of China, Mr. B. Lennox Simpson, quoted the Russian statesman in order to strengthen China's contention that the Russian government was not the owner of the Chinese Eastern Railway. When Mr. Simpson, in his dual capacity of Far Eastern expert and adviser to the president of China, quotes Count Witte in order to fortify a case for the Chinese government Witte's evidence must be accepted in other matters. Witte's testimony concerning the Li-Lobanoff alliance must therefore carry conviction, and with the subsequent filing of the treaty at Washington, China stands exposed before the world of having secretly aided, comforted and encouraged Russia by ceding her territories to the latter in order to revenge herself upon Japan. When it is recalled that this secret treaty of alliance was in full operation during the Russo-Japanese war, and that in conformity with its provisions, the Russian Baltic fleet might have entered the port of Foochow and employed it as a base for recoaling and refitting before hazarding the great battle

of the straits of Tsushima, it would have meant for Russia the difference between defeat and stalemate. As admitted by Mr. Lennox Simpson in his new book, " those amongst the delegates at the Washington Conference who had personal knowledge of the Far East were impressed by this flask of lightning into the murky past!

When it is furthermore recalled that Russia played false to her ally and would have annexed Manchuria and closed it to foreign trade, the Japanese are fully justified in the claim that they restored China's sovereignty over her lost Three Eastern Provinces. This, notwithstanding the secret alliance which made the Russo-Japanese war possible.

As to the twenty-one demands they went too far and covered too much ground. If granted, they would have made China for all practical purposes, a vassal of Japan. It can, however, be said in extenuation, that Japan was sorely provoked and hard pressed, owing to China's continued intrigues with Russia, either direct, through her ally or through her financial agent. It cannot be denied that Russia was exerting every effort (in which she was supported at all times by France and Belgium) to get into a position that would enable her to resume the conflict terminated by the truce of Portsmouth. Her way was made easy by the weakness and supineness of Chinese officials who paved the way for Russia to dominate their country and strike at Japan from an unprotected flank. Russia's activities in Mongolia compelled Japan to demand the right to construct the Taonan-Jehol railway, already referred to, and later on when it became evident that Russia had split China in half, north to south and east to west by her strategic railways, and that China had secretly handed over to France exclusive railway privileges in Kwangsi, and was hastening the day of her undoing by other concessions impairing her sovereignty, Japan had no alternative but to make sure of her position in Kwantung and Manchuria and enable her when the time comes, to defend not only her own but the integrity of China.

The twenty-one demands could and should have been reduced to one, but true to Oriental diplomacy, Japan lumped together all that she could think of in order to gain her main point. Had Japan confined her demands to the extension of the Kwantung lease she would have obtained all that she had a right to expect to receive from China. In fact, there was no hesitancy on the part of China in granting this extension, as the records of the negotiations go to prove. Japan simply overdid it and lost out before world opinion by attempting to conceal the truth. It was a stupendous blunder, one which cost Japan dearly in the esteem of all other peoples.

However, the basic necessity of holding Kwantung still remains, perhaps stronger than ever, and there is little likelihood under existing conditions that Japan will admit any discussion of the treaty which assures her territory and that of China against further agression from the north. In the twenty-one demands, Japan appeared before the world in the rôle of an aggressor. Since then, she has surrendered or withdrawn all these demands, except one. She insists upon the validity of the Manchurian treaty which extends the Kwantung lease to 99 years. The other clauses of the treaty are not obnoxious in themselves, as by reason of the most-favored-nation clause in other conventions, they extend automatically to all other nations. The rights so obtained are not exclusive to Japan.

In holding Kwantung, Japan's position is changed. It is not a spirit of aggression or desire to impair China's sovereignty which impels her at this time to retain this strategic vantage point. She remains there to defend not only her own safety but the integrity of China during such time, at least, as China's remains unable to discharge her international obligations in these regions.

There remains one important angle to this question which should not be lost sight of. The masses of Japan have supported the liberal statesmen in their many concessions to world opinion and strongly approved of every effort to regain the good-will and friendship of China and make amends for past errors in diplomacy. In fact, it may be said that the cardinal feature of Japanese policy at this date is based on the re-establishment of cordial relations with her neighbor. There is evidence, however, in the Japanese press, that the limit of concessions has been reached and that any attempt to bring pressure to bear upon Japan in order to compel her to evacuate Kwantung next March, will crystallize into a patriotic movement lining up the nation solidly behind the militarists. Liberalism in Japan would then receive a set-back for another generation.

The Japanese already feel that they have surrendered more than any other great power in the interests of world peace, and especially in order to work in harmony with the United States. Any campaign to compel them to relinquish a strategic advantage upon which the very safety of their empire depends, will be more than they will stand.

It is not altogether improbable that the drift of world events, coupled with the agitation over the validity of the Manchurian treaty, will determine Japan to completely modify her present pacific and passive attitude, and following the lead of other powers whose vital interests have been placed in jeopardy, insist upon a readjustment of the *status quo* that will permit her a free hand in Manchuria. Japan may do one of four things. She may call upon the United States, Great Britain and France to enforce the principle of China's integrity in Mongolia. She may demand that China herself be called upon in the interests of world peace to discharge her international duties and defend her own integrity and neutrality. She may demand the right to co-operate with China as an ally in enforcing the consortium doctrine, or, failing in the above, Japan may determine that her own interests are paramount and act as the sole defender of China's integrity and take such measures as she deems fit to assure her own safety.

It stands to reason that no other powers will send troops into Manchuria or Mongolia to enforce a paper doctrine against Russia. Least of all will the United States send an army across the Pacific for this purpose. In fact, the way things are drifting, it will not be long before the United States will return once more to the days of 1917, Chinafied and emasculated by the pacifists, powerless to defend herself against any first-class enemy. Britain and France have troubles of their own and will be more likely to give Japan their blessing and tell her to look out for herself. It is difficult to imagine China at this time sending a force to oust the reds from Mongolia, and if the past is any criterion for the future, an intense jealousy will seek to obstruct any alliance or military co-operation between Japan and China for mutual defense. There remains the alternative, the last resort of a proud spirited fighting race facing slow strangulation through the operation of self-denying treaties entered into for the advancement of world peace, that is to say, peace in Europe, peace in the Pacific and the hamstringing of Japan in Asia.

" Kemal Pasha overthrew the treaty of Sevres and defied the allies in Europe. It may be that Japan, to protect her vital interests, will be compelled to follow his example in order to preserve the integrity of China and the peace of the Far East." These are the words of a highly placed Japanese army officer in concluding a general *resumé* of the present situation. They are significant, and to the point. They carry this warning from Japan to the other powers: " Make good your paper doctrines and protect the integrity of the Chinese republic in Mongolia, or stand aside while we do it ourselves." In the present condition of world affairs there is little doubt of what the answer would be.

II. MANCHURIA

The Other Side of the Question

Japan At the Parting of the Ways

LET us now look at another side of this question. It may not reflect the views of the Japanese government as at present constituted, but that it is advocated by a considerable section of Japanese opinion is attested to by editorials in many influential newspapers. We must face the possibility of Japan falling in line with other trading nations and scrambling aboard the Red band wagon while there is still room in the front seat. Japan may resume friendly relations with Russia, she may enter into a new commercial treaty, and, who knows, she may go one step further, renew the alliance of 1916 and work in harmony with the Soviet for the defense and advancement of their mutual interests in Asia. There are many things that Japan can do that will nullify the understandings already arrived at, which at bottom, all tend to circumscribe her activities and power of defense.

The Japanese are not blind. When they view the efforts of British and American financial interests to gain the good-will of Russia and gather the fattest plums from the wide spreading concession tree, a people forced to look towards Eastern Asia as the source of their food supplies and raw products are not likely to remain altogether inactive while their future is being handed over to others. As the *Osaka Mainichi* puts it:

"In the event the Far Eastern government is annexed by the Moscow government and Soviet rule is extended as far as Vladivostok, what policy is the Japanese government going to adopt ? If all that the Japanese government authorities and militarists have been saying about the Soviet rule is to be taken at its face value, this must be said to be a very serious situation. Even Count Uchida, the foreign minister, declared in the diet that the object of the maintenance of the Japanese troops was to prevent the spread of Bolshevism. If this was so, how can Japan effectively prevent the spread of Bolshevism now that the Japanese troops are withdrawn from Siberia and the Soviet rule threatens to extend to Vladivostok ?

But we incline to the belief that nobody will be really alarmed by the new situation. For we know that the theories so far advanced by the government authorities and militarists were invented simply for the purpose of justifying the continued maintenance of the Japanese troops. They never seriously thought that the Japanese people, if left to themselves, would be converted to Bolshevist ideas.

The dissolution of the Far Eastern republic and the display of red flags throughout Siberia need cause no alarm in the Japanese minds. The necessity of the moment is how to shape the policy of the Japanese government to meet the new situation. In other words, it is important that the Japanese people should look the new fact full in the face and devise the best means possible to cope with the new situation. As we have urged in these columns, it is incumbent upon the Japanese government to try to promote the state interests on the basis of friendship with Russia."

From the above, it would seem clear that the *Mainichi*, speaking for the great industrial community of Osaka, would rather see its government follow the lead of Great Britain and America and get in on the ground floor while the door is open. The *Japan Times*, in one of its severe criticisms of the foreign office, is also alarmed over the many commercial advantages secured by others while Japan is still on the outside, and asks :

"What plan have our diplomatic authorities in mind for dealing with Russia ? While they are hesitating and undecided, adopting the watching and waiting attitude, the Europeans and Americans lose no time in reviving economic relations with Russia and have already established good foundations for re-opening connection with Russians economically.

The foreign office authorities are apparently waiting for the arrival of the time when the Russian government is willing to accept Japan's demand for compensation on account of the damage caused by the Partizan raid on the Japanese in Nikolaivesk. No doubt Russia is held responsible for the regrettable affair, but at the same time Japan should listen and consider Russian claims. The Russian delegate M. Joffe declared at the Changchun conference that Russia suffered immensely through the troops of Japan and incurred an estimated loss of approximately 100 million yen through the devastation of agricultural produce, requisition of farm houses ; stoppage of fishery and communications, etc. The claim of the Russian delegate is not without some reason. But if the spirit of mutual concession is not adopted any amount of negotiations between this country and Russia will not avail. In the meantime the concessions are going."

This also indicates that certain elements in Japan are anxious to follow the " Business First " slogan of other trading nations, and let vital strategic policies go hang. The above and other similar expressions of Japanese editorial opinion reveals a desire to re-open relations with Russia, which, in the very nature of things, will bring about an understandng in regard to their respective rights and positions in Manchuria. Typical of the reading matter wh.ch sets the Japanese to thinking seriously, is the interview between the Moscow correspondent of *The Times* (September 28) with the chief of the delegation of the Far Eastern republic sent to the Washington conference, in which the latter says :

"The Japanese are out for the northern half of Saghalin, and large concessions in Kamchatka and the Priamur, and they will not be content with less.

"Meanwhile, America is interesting herself more and more in Siberia. General Graves, formerly in command of the American force which landed at Vladivostok in 1918, and now interested in various concessions in the Priamur, is on his way to Vladivostok from Seattle, along with Mr. Grossbardt, an engineer with extensive Siberian experience, and the representatives of several large financial concerns in the States. They are all interested in those concessions, and so is *General Wood*, Mr. Henry Hunt, of Cincinnati (engineering firm), Messrs. Montgomery & Co., of New York (bankers), the National City Bank, the Koehn Loeb Company, the Guarantee Trust Company, the Equitable Bank, the Baldwin Locomotive Company (which is talking of repairing all the railways in the territory of the Far Eastern republic, if normal political relations are restored between that government and Washington), Messrs. Funston, of New York and St. Louis (fur people), and Robert Dollar, timber merchant, who is getting forest concessions in Eastern Siberia.

"The concessions which General Graves is said to be after are gold ; but personally I think that no hard-and-fast agreements have so far been concluded between the Chita government and any American groups. General Graves, I take it, is simply going to Siberia to have a look around ; and I think that he will find labor, political, economic, and transport difficulties so great that no work can be done for years. . . . By the time my informant and his delegation reach Chita, General Graves and his friends will be there, and arrangements about Russo-American commercial co-operation in the Far East will have been begun. It was probably a knowledge of this activity on the part of the Americans in Eastern Siberia that caused the Japanese to announce recently that they were leaving Vladivostok, and to agree to an exchange of views with the representatives of the Moscow government and of the Far Eastern republic.

"The Baldwin locomotive people are to repair all the railways in the Far Eastern republic, and other large American concerns are talking of undertaking other work and taking up other concessions ; but so far this has not got beyond the talking stage, and all depends on the regularization of political and commercial relations between Russia and the States. Possibly, said my informant, America will first recognize the Far Eastern republic and do business with her, and then be led on to recognize the Moscow government.

"He maintains that the Far Eastern republic is not communist, but a democratic state, independent of Moscow, but under Moscow's protection at present owing to the Japanese menace. He looks forward to the time when Vladivostok will be quite clear of Japanese and will constitute a door opening out towards America, and with nobody blocking it. When that day comes America will do very big business in Eastern Siberia, as she did before the war."

The reference to General Wood being interested in Siberian concessions is pure piffle and indicates the extent of the belief in Russia that Americans of all classes are anxious to get in on the ground floor. The above interview is supplemented in the *Japan Times* by the following :—

"While our diplomatic authorities are indulging in their wonted idle day dreams and forming mistaken policy towards China, the ambitious Americans have succeeded in courting the goodwill of the Chinese and won both their trust and rights and interests from the Chinese. Again while the Japanese diplomats were occupied in endless and useless negotiations with the Russian delegates at Changchun, a certain American concern obtained the lease for the oil district in Northern Saghalien and will start working the field shortly. Though outwardly against Russia, the Americans have secretly shaken hands with the Russians and are securing rights and interests in Siberia ahead of all other nations.

"Not only America, but Britain also is anxious to revive economic relations with Russia and France is casting sidelong glance Russiawards. The latest dispatch from Moscow says that France is anxious to revive her old friendship with Russia and re-enter an alliance with that country. With this in view, France is opposed to Britain's Dardanelles policy and wants to support Russia, thereby to court the goodwill of Russia. In other words, France objects to the proposal of Britain to solve the Dardanelles problem, excluding Russia, and insists on the injustice of settling the question without Russia's participation in the negotiations.

"While nearly all of the world powers are eager to court the goodwill of Russia in order to secure rights and interests in Siberia and thereby enhance their national coffers, Japan alone refuses to shake hands with Russia and commits the folly of missing a fine chance, open to her, for securing economic rights and interests in Siberia, which will fall entirely into the hands of far-sighted nations and be lost to Japan when she wakes from her slumbers at the eleventh hour. Who knows when another Washington Vanderlip may appear and carry away the right of exploiting the vast, inexhaustive, and rich resources of Siberia, lying so closely in Japan's neighborhood?

"Remarkable are the activities of the Americans, who fixing their eyes on these resources of Siberia, are striving to secure rights and interests to explore and exploit the world's treasury of wealth in Saghalien, the Maritime province and Inner Siberia.

"A report to hand says that only a few days ago the American warship *Monoghan*, conveying several American congressmen and representative American businessmen, arrived in Vladivostok on an exploration trip to observe the condition obtaining on Commandorsky island, called the world's great treasury of fur seals, and the coast district of Kamchatka. The party is reported to have already concluded its mission and reached Vladivostok with a view to further observe the condition in the Omsk district in Inner Siberia. This is just a single instance, illustrating the daring spirit and far-sighted enterprise of the Americans."

We have quoted the above editorial at length as representative of a certain section of Japanse thought. If the Japanese accept these stories as true, they are justified in believing that advantage is being taken of their disputes with Russia and China to supplant them economically in regions from which they were compelled to withdraw under pressure of foreign opinion. It is clear to the close observer that the Japanese are awakening to the suspicion that in Siberia, as in China, other interests have taken advantage of their vital strategic necessities to undermine them economically. With the prospect of China declaring the Manchurian treaty null and void supported by foreign sympathy, and thus destroying her economic foothold in Manchuria, Japan would then be dependent upon Eastern Siberia for a large part of her raw products and other necessary supplies. Under these conditions, with all doors closed to her people in lands dominated by the white man, debarred from settling in China through the operation of laws which exclude foreigners from owning land outside the treaty ports, and confronted with the possibility of relinquishing her position in Kwantung, while watching American and British concession hunters skimming the cream from the Russian business, it is not to be wondered that a considerable section of public opinion in Japan is now advocating recognition of the Soviet, the establishment of friendly relations, restoration of trade and recognition of mutual interests in disputed territories.

In plain words, the operation of Western diplomacy combined with the moral support of the West to China in raising the issue of Japan's position in Kwantung, may have the effect of throwing Japan into the arms of the Soviet as the one assurance that her vital economic interests in Manchuria will be respected.

This element in Japan believes there is little to be gained by casting in their lot with America, Great Britain and France, whose altruistic policies towards China and Russia forced a surrender of their vital strategic and economic positions. The operation of these same policies has permitted Russia to once more regain a position inimical to Japan's safety, where, if matters are permitted to drift, the issue of 1904 will have to be fought out anew. Instead of advancing her economic and tactical position by an alliance with Britain, America and France, Japan finds herself stripped of all advantages and once more face to face with Russia in Manchuria with a movement launched with the moral support of a large section of Americans and British, to deprive her of her key position. The time is fast approaching when she must either take on her own shoulders the maintenance of the consortium principles and defend the integrity of China, or, follow the road of least resistance, by joining the procession and climbing into the Pink painted band wagon.

If Japan should elect to take this path out of a difficult and dangerous situation, what about the future? Why should Japan fight Russia for the maintenance of a principle that no other power will use force to uphold? Why should not Japan be friends with Russia and resume their understanding in regard to each other's positions in Manchuria and Mongolia? Why should Japan follow along in the company of partners who at every turn are reaping the commercial advantages while she is being reviled and held up to world scorn for practicing in Asia what other powers are applauded for doing in Europe? If this line of thought should prevail and the people and government of Japan elect to resume friendly relations with Russia, and so obtain recognition of their economic position in Manchuria and the right to exploit valuable concessions in Eastern Siberia, who would check the forward moves of the Soviet backed by Germany in other parts of Central Asia? If Japan declines to antagonize Russia in Asia, what then?

Russia has many friends in Japan and it was the weight of their opposition as much as foreign criticism which finally inclined the government to withdraw its troops from Siberia. If their policy should prevail, it would not be difficult, at this time, to bring Japan and Russia together in an understanding that would have a most far-reaching effect on the Asiatic problem. Japan stands at the parting of the ways.

III. MANCHURIA

STUNG!

NOW comes Viscount Takaaki Kato, Japan's foreign minister in 1915, who drew up the twenty-one demands, and states that there are no grounds for the allegation of China that the treaties based on the demands were signed under compulsion." "THE ULTIMATUM," the viscount declares, "WAS SENT TO CHINA ON THE REQUEST OF THE CHINESE GOVERNMENT IN ORDER TO SAVE THE FACE OF THE AUTHORITIES OF THE NATION"!!!!!

Kato's statement is the most important truth in recent Far Eastern history. It is fundamental. Here we have been laboring under the delusion all these years that defenseless China was the innocent victim of Japanese aggression, forced to sign away her rights at the muzzle of the gun. The whole world has responded to her appeal for sympathy. Japan's ultimatum of 1915 has been the pivot upon which Far Eastern history since that date has revolved, the thesis upon which scores of weighty volumes have been written and scattered broadcast over the world indicting Japan as the ruthless robber, the cold-blooded aggressor, the disciple of Germany in Asia. The ultimatum lined up every American on the side of China and laid the foundation of that hostility which influenced our diplomacy at Paris and led to the calling of the Washington conference to settle our differences. Commencing with the writer, who carried the brunt of the battle for China in 1915, down the line through a list of brilliant journalists, diplomats, advisers and others, who accepted without question China's version

of the negotiations surrounding the twenty-one demands, we all stand before the world as having been used by secret Chinese diplomacy to wage a fight on high moral grounds in order to preserve the face of a scheming dictator seeking Japan's recognition of his right to mount the dragon throne.

The evidence is conclusive that the secret diplomacy of Li Hung-chang precipitated a most disastrous war between Russia and Japan, in which China escaped paying the penalty, in fact, emerging from the conflict as the injured and innocent victim. Now we have the confession of Viscount Kato, which says in effect, that the secret diplomacy of Yuan Shih-kai, the concealment of the most vital fact in the negotiations surrounding the twenty-one demands, created an international political situation which nearly culminated in a war between the United States and Japan, and in which by reason of the profound secrecy maintained, China once more poses as the injured party.

Up to the time we go to press, no newspaper in China has published Kato's statement, and dollars to doughnuts the disclosure has not even been telegraphed to the American or British press by the regular correspondents in Tokyo. Upon the truth of this statement hinges the professional standing scores of journalists, statesmen and diplomats, nay, even the policies of governments must be radically modified to meet this astounding disclosure.

If true, and Kato is the one man competent to make this confession, it is quite evident that Chinese officials are in no need of expert foreign advice. They can give foreign diplomats cards and spades with the joker thrown in, and beat them at their own game. Bret Harte was right:

> " In his sleeves, which were long,
> He had twenty five packs."

We confess an admiration for officials who can systematically " put it over " the keenest experts and observers, mislead foreign governments to the point of precipitating hostilities, and look childlike and bland while a horde of advisers are playing their game for them. What we cannot understand is the remarkable reticence of Viscount Kato, who, in order to save the face of China, permitted the face of his own country to be lost. Imagine the situation. Pressed to accept the demands, Yuan confidentially suggests that in order to save his face, Japan should present an ultimatum. Kato falls into the trap. Maintaining the most profound secrecy about his part in the incident, Yuan broadcasts the story of Japan's rapaciousness with the result that world opionion swings solidly behind China while Japan is ostracized as impossible, another Germany. Kato dared not reveal the truth and invite attention to his defeat. Only, at the eleventh hour, when China is preparing to press for the retrocession of Kwantung, does he break the silence of seven years, and admit that he was " stung."

The interesting part of this disclosure is that Dr. Sun Yat-sen has insisted upon this version of the facts ever since 1915. He has declared, on several occasions, that it was all a put up job on the part of Yuan who was willing to place China under the tutelage of Japan in exchange for the latter's recognition of the new dynasty he was even then preparing to found. Sun corroborates Kato in that the ultimatum was faked to save the face of Yuan, and permit him to go before the nation as being compelled by superior force to accept the new conditions. At that period Sun was an exile in Japan, working in close harmony with the Japanese general staff. He knows what he is talking about.

The Chinese beat us at our own game with the cards stacked against them. They need no champions or coddling. They are in no danger of losing their independence as long as a sentimental foreigner survives or as long as other nations eye each other with jealousy and fight over the prospect of winning their good-will. A Chinese philosopher a century or so hence will sit on the ruins of London Bridge or the rusting scrap heap that was once the Woolworth Building and chuckle quietly over the fool mistakes of the wild barbarians who tried to hustle the East and teach his ancestors how to do things. This disclosure of Kato will wreck the reputation of many highly placed experts. The very last thing that Mr. Lennox Simpson explains in his recent book "An Indiscreet Chronicle From the Pacific " is the " true facts which have hitherto been closely guarded" surrounding the events leading up to and the reasons for the presentation of the "ultimatum." His version disagrees with that of Viscount Kato and Dr. Sun just one hundred per cent. At any rate, after reading the " true facts " as revealed by the high adviser to the president of China and the *truth* as disclosed by Viscount Kato, we retire to the background as an authority on these matters. We leave it to the high adviser to prove his " true facts " and answer the statesman of Japan, and will watch from the gallery the efforts of other experts to extricate themselves from the mess. It will be interesting to see how they accept the statement of Viscount Kato.

IV. MANCHURIA

Equal Opportunity in Manchuria

WE cannot close this presentation of facts surrounding the Manchurian problem without some reference to an article entitled " Japan in Manchuria to Stay," appearing in the columns of our sprightly local contemporary, *The Weekly Review*, that " aggressive official American organ " whose policy is one hundred per cent. different from our own. The following may help to explain why such a wide divergence of opinion can exist between two exponents of American ideals in the same field, and indicate that this difference is one between hyphenated American sentiment and every-day-horse-sense.

Mr. Charles Dailey, the writer of the article, admits that Japan is in Manchuria to stay. On the whole his article is one of the sanest that has yet appeared on this question, but he destroys the value of an otherwise important contribution to a serious discussion, by harking back to the old fable about Japan's special privileges in that territory which gives her traders the advantage over all competitors. In the Manchurian treaty of 1915, signed as the outcome of the twenty-one requests, Japan obtained for her subjects certain rights as to residence and trade outside the treaty ports, and nearly every superficial writer on the subject has since accepted the first impression that these were exclusive, when, as a matter of fact, through the operation of the most-favored-nation principle, they automatically extended to all other treaty powers. Japan therefore has no special position or trading rights in Manchuria not enjoyed by all other nations. This was admitted by Baron Kato at the Washington conference, when, speaking for his delegation on November 19, he said:

" We adhere without condition or reservation to the principle of the 'open door' 'or equal opportunity in China.' We look to China in particular for the supply of raw materials essential to our industrial life, and for food-

stuffs as well. In the purchase of such materials from China, as well as in all our trade relations with that country, we do not claim any special rights or privileges and we welcome fair and honest competition with all nations."

No Japanese statesman, diplomat or publicist has ever construed the Manchurian treaty of 1915 as conceding benefits to their country, not shared by all. We emphasize this situation, and invite the attention of all sober-minded Americans to the fact that these continued exaggerations concering conditions in Manchuria operate to keep them from enjoying their treaty rights, and to deter them from establishing branch offices in this province. As a result of years of misrepresentation, American firms have developed a case of cold feet in regard to the Manchurian field, and handed over their business to Japanese or British interests. At the present moment, there are just two American firms registered in the American consulate at Dairen, the ubiquitous Standard Oil Company and its pushing competitor, the Texas Company, with a young American occupying desk room in the office of a Czech concern, representing the important vegetable oil house of Aspergren & Company of New York. This is all.

In fourteen years, the South Manchuria Railway Company and allied Japanese industrial enterprises have probably expended $100,000,000 gold for American materials, not to mention the vast amounts that go to make up the exports of bean oil and other products. An equal amount has also been expended for British and other foreign materials. The impression that American firms could not compete in this territory has tended to keep them out, while the vast orders for American materials have been placed through Japanese and British representatives of our manufacturers. The British have obtained their fair share of the orders for British materials through their own firms established in Dairen. The practice of the South Manchuria Railway Company is to call for tenders for supplies and confine their patronage to firms having actual representation in Dairen, a very wise and necessary policy in building up a new city under its own administration. The only sufferers as far as we can see, are American firms who have listened to the tales of their countrymen who threw up the sponge early in the game, and have ever since been damning the "Japs," in order to justify their own failure. One hears little growling or grouching from the British firms in Dairen, who say little, saw wood, and see that British manufacturers receive their share of such business that is offering. The great volume of orders for American material has gone through the Japanese representatives of American manufacturers. A few American middle men have suffered, but American trade on the whole has benefitted. There is no reason, however, why this condition should be perpetuated. If American trading firms want the orders the place for them is in Dairen. They are assured of a square deal, despite the fables to the contrary.

Mr. Dailey, in the article in *The Weekly Review*, stresses the point that American firms are discriminated against because of the operation of the Manchurian treaty and cites the following instance to support the contention that this interpretation of the treaty has been accepted by the Chinese authorities:—

"So Chang Tso-Lin seems to be barking up a hollow tree when he says that no matter what Peking may have done under force or duress or whatever the enemies of Japan accusse her of applying—no matter what—Manchuria never has recognized the twenty-one demands. The facts are that the existence and provisions of the new treaty have been recognized by Chang Tso-Lin's ablest henchman, General Sun of Kirin."

"And the recognition came in a way quite unfavorable to the United States, or any other country interested in trade in interior China. Shipments of oil to points in Kirin province are being heavily taxed as a local measure and the Standard Oil Company of New York recently had the matter taken up with the officials of Kirin province, because there was discrimination in favor of the Japanese. It was in reply to this protest that the governor of Kirin made the recognition of the 1915 treaty, if any recognition were required after its enforced acceptance by Peking."

"General Sun, in an official letter to the provincial treasury held that special local taxes could be levied against the American concern because it, with other foreigners with the exception of Japan, is denied the right of establishing agencies at non-treaty ports. The exception in favor of Japan was cited under the 'new treaty' between China and Japan, which means the treaty enforced under the twenty-one demands. Under this treaty, General Sun pointed out, the Japanese are permitted to establish agencies and to carry on business anywhere in South Manchuria, including Kirin province, and in Eastern Inner Mongolia. This clinched the case for Japan. Incidentally it put the seal of commercial handicap upon other foreigners attempting to do business in the non-treaty ports of that region."

It would appear from this that the tuchun of Kirin interpreted the Manchurian treaty to meet his urgent demands for revenues and "held up" the Standard Oil Company for taxes he did not dare to impose upon the Japanese. If, as General Sun points out in extenuation, "the Japanese are permitted to establish agencies and to carry on business anywhere in South Manchuria, including Kirin province, and in Eastern Inner Mongolia," by the same token the same privilege extends automatically to American concerns. The truth that shines out from this instance, is not that Japan has any special advantage over American firms, but that General Sun has for his own purposes construed the treaty to justify an irregularity. Japan is not to blame for this, and it would furthermore seem, that the Standard Oil Company has a legal right to claim and recover not only such taxes as may have been paid in excess of those levied upon Japanese produce but such damages as would compensate for the loss of the trade handed over to its competitors by General Sun's failure to recognize the most-favored-nation principle, which applies in this case.

The situation in Manchuria is identical as that which existed a year or two ago, when such a hullabaloo was made over alleged Japanese discrimination against American trade in Tsingtau, and where subsequent investigation disclosed the fact that there were only two American firms on the ground, the Standard Oil Company and Katz Brothers, the latter working in close co-operation with the Japanese. The reports of the American consul at Tsingtau bore witness to the fact that no such discrimination existed, that the field was open for Americans to enter on an even footing. The damage, however, was done to American trade by continued perversion of facts existing only in the imagination of certain agitators. American firms developed frigid pedal extremities and remained away, while their more adventurous competitors walked in and won out.

American business in Dairen, the commercial door to Manchuria, is conducted by British and Japanese firms because of this same propaganda. It is about time that a stop was put to such distortion of facts, which tend to discourage American enterprise in these regions. If the Standard Oil Company has been made the victim of General Sun by his failure to discharge the treaty obligations of his government, it certainly does not indicate discrimination against American trade by Japan. The shoe is on the other foot; China is the villian in this plot. Perhaps this may be accepted as an disinclination on the part of the American government to recognize these treaties. That, of course, puts the whole matter on a different basis, which works out to the detriment of the American trader until such time as the treaty is revoked. This carries the situation into realms of delicate international politics, and in view of Japan's determination to retain at all hazards her position under this treaty, creates a most serious question. We doubt, however, whether this view of the matter is the correct one, as it would call eventually for American armed support to China in demanding the retrocession of Kwantung and the nullification of the treaty. Perhaps the revelations of Viscount Kato as to how the ultimatum was invited may reverse current opinion on this much discussed problem, and open the way for American firms to enter Manchuria on an even footing with those of Japan and compete or co-operate for its development. Whatever rights Japan has acquired in Manchuria, aside from the extension to the Kwantung lease, are American rights as well. As long as the treaty is in operation, Americans are entitled to all its advantages. If we fail to exercise those rights, it seems unfair to shoulder our failure on to Japan.

V. MANCHURIA

Politics and Pedestals

" An Indiscreet Chronicle from the Pacific "

Being a Review of a Book with the above Title written by B. L. Putnam Weale, and published by Dodd, Mead & Company of New York. For sale by all Booksellers.

"MEN'S legs are more important as a political indication than their hands and heads and should always be attentively studied," says Putnam Weale describing the "dislocated knees and small feet" of Secretary Hughes, denoting, according to the author "a proneness to the influence of others: a tendency to accept formulas without proper inquiry; an absence of true convictions." "Questions are never indiscreet, answers sometimes are," is the maxim on the title page quoted from Oscar Wilde. This emboldens us to be inquisitive and ask if the Adonis-like proportions of the nether and pedal extremities of the hero of the forbidden palace were in any way dislocated on a memorable occasion by that "mighty up driven blow of his right knee" which curled up the chief eunuch guarding the untasted forbidden fruit of an emasculated emperor? We ask this, because if the contour of a man's pedestals is any indication to his political balance, then the author of *Indiscreet Letters from Peking* and still further indiscreet chronicles from the Pacific should possess a marvellously corrugated pair of artistic plinths, or a leg like unto the hind one of a Boston bull pup. Which calls for explanation.

The publisher's note to the new book says that "Putnam Weale is the pen-name of Bertram Lenox Simpson, an Englishman in the political section of the office of the president of China. Beginning his official career twenty-six years ago, under the late Sir Robert Hart, the famous head of the revenue in China, he resigned after the seige of the legations and began writing books of which there are now nearly twenty to his credit. Of his former chief, he says, "He trained me with a rod of iron." His literary method discloses his early training. After the revolution of 1911-12 he received offers to re-enter the government service. But it was not until 1916, and the overthrow and death of Yuan Shih-kai, that he resumed work in the political department. Since then he has been sent on many missions and is *mainly responsible for the reports on foreign affairs.*"

Mr. Lenox Simpson is an accomplished writer, the best the Far East has produced, but we incline to the belief that Sir Robert made the mistake of his brilliant career in not completing the training of his promising protege. If he had, the literary methods of Putnam Weale in political affairs might have been another feather in the cap of the great I. G., another monument to his training and handling of men. And to make this clear, we will quote from page 9 of "An Indiscreet Chronicle from the Pacific."

With the collapse of China the immense corruption of Russian imperialism had at last reached the Far East in force by the land route. Russia had been nibbling for a generation: now she opened her mouth and bit hard. The balance of power was not only changed by this event, but history inevitably took a new road far away from the sea-lanes which had until now monopolized attention. The greatest importance must be attached to this dislocation which has no parallel in the annals of the East, and to which is directly due practically all world disturbance during the last quarter of a century.'

Right here the author started out as Sir Robert would have him do, standing squarely upon an admirable pair of legs with both feet firmly planted in a truth. The collapse of China in 1895 and the secret alliance entered into immediately afterwards in order that China might be revenged upon Japan, is the KEY to all future political events in the Far East, the play which started every European power and Japan, to protect their interests in Asia by countermoves on the political chessboard. But because Mr. Lenox Simpson is the high political adviser to the president of China, and director of Chinese political propaganda, he would never admit a truth that throws the onus of what followed on to his clients. He is paid to avoid this. He makes a good job of it.

On page 11, after a brief *resumé* of other conditions, Mr. Simpson tells us:

"The Russo-Japanese war put Japan back where she had tentatively been in 1895, with the valuable addition of railways. IT IS FROM THIS MOMENT THAT THE MODERN HISTORY OF THE FAR EAST COMMENCES."

> **A FUNDAMENTAL TRUTH**
>
> **"I am thoroughly convinced that the blood-stained heights of Port Arthur will never be surrendered and the territorial lease cancelled until the part they played in destroying Russian imperialism has been fully and adequately recognized by China in messages to Japan."—*Putnam Weale.***

Right here Mr. Simpson shifts his foothold and steps from a solid foundation into a morass, flounders around for some 250 pages, then jumps out for a minute on to terra firma before once more slipping back into the bog, where he remains. If Mr. Simpson's first statement is correct and Russia's advent into Far Eastern politics is responsible for all world disturbances during the last quarter of century, then modern Far Eastern history begins in 1895 and not with the Russo-Japanese war, ten years later.

The immediate outcome of the Sino-Russian secret treaty of alliance was to present Russia with an ice-free port on the Pacific, at that time a direct challenge to British sea-power in the East, a menace to her hold upon India. When Russia started on her secret program to reach the northeast frontiers of India by means of strategic railways traversing the territory of her ally, evading her convention with Great Britain to confine her railway activities north of the great wall, the British government presented its demands to China, backed by an ultimatum, for compensatory damages. The Yangtze valley region was created into a zone of strategy to act as a buffer between India and Russia. Subsequently, to counteract the operation of the Sino-Russian partnership, Britain entered into the alliance with Japan. Instead of being an instrument for the impairment of China's sovereignty, the Anglo-Japanese alliance was a guarantee of her integrity jeopardized by her own foolish pact with a power intent upon her spoliation. The evidence of this is seen in the peace of Portsmouth, where China's sovereignty was restored over the territories she surrendered to Russia, and considered by the latter as part of her empire, to be converted into special preserves similar to her possessions in Central Asia.

When this fundamental fact is recognized, the bottom falls out of Mr. Simpson's elaborate case built up on another hypothesis. The book deals with steps taken largely on the initiative of Mr. Simpson to bring about the demise of the Anglo-Japanese alliance treaty, and to accomplish this, he ignores the origins of policies whose operation he denounces; he eliminates from the record the

memorable months of 1898, when the "Battle of Concessions" parcelled China into zones of strategy, miscalled spheres of interest, and starts his history with the Russo-Japanese war, in itself the culmination of ten years of China's secret diplomacy.

Instead of frankly admitting, or at least referring to the causes underlying the signing of the first Anglo-Japanese alliance, and so justifying his own country before China for taking such measures for the protection of its vital interests, Mr. Simpson falsifies the record by insisting that the real rôle of the alliance was to impede the progress of and do for China the greatest disservice any foreign agreement had performed at any time in her history." As Mr. Simpson starts out to destroy this instrument, he naturally goes to extremes and ascribes all the woes of China to its operation, purposely refraining from any mention of the fact that it was China herself who invited and made it necessary.

We might write another volume analysing the "Indiscreet Chronicle from the Pacific," and, by comparing notes, show how the words and views of other advocates of extreme measures coincide with those of Mr. Simpson: how the desperate efforts in China to support Mr. Millard when he was calling for war in Congress, all played into the hands of the Peking plotters, how the campaign in England to intimidate the British government by the threat of a boycott of British goods if the alliance was renewed, synchronized with the agitation in Shanghai directed from Peking; how an international association in North China, consciously or otherwise, encouraged the Chinese by distributing confidential pamphlets calculated to incite hatred against Japan; in fact from the knowledge gleaned from Mr. Simpson's indiscreet revelations we might be justified in denouncing and arraigning the misguided sentimentalists, whose utterances and actions made possible the plot hatched in Peking to railroad the United States into hostilities with Japan.

It might be indiscreet to request Mr. Simpson to be a little more explicit as to the meaning of the word "WE," employed so often throughout the book. "In Peking, long before the world war, *we* had reached the conclusion that there were only two countries (America and Great Britain) important to the Chinese." . . . As early as the spring of 1920, *we* had decided in Peking that no reasonable hope could be entertained for China's salvation with this treaty (the Anglo-Japanese alliance) in the way." What do you mean, WE? Do you mean, Mr. Lenox Simpson, Putnam Weale and yourself; do you mean Putnam Weale and the Chinese government, or Lenox Simpson, and the other high advisers to the Chinese government? Who was responsible for this great war program in which "China would seek a rapprochement with the United States and offer her naval bases on her coasts together with any other concessions she may desire"? Who drew up the confidential plan called "The defence of the gulf of Chihli scheme, designed to protect the approaches to the capital, Peking, pending *American* mobilization"? Are we to suppose that here is where the "WE" is intelligible, and it means that Mr. Simpson and the Chinese government had the plan all drawn up to precipitate the "show down" and hold the gulf of Chihli pending the arrival of American forces? If ever an international intrigue justified the investigation of a joint congressional committee, this conspiracy hatched in Peking to plunge the United States into a war with Japan, calls for action. It was not Great Britain, France, or any other power, who was to rake the Chinese chestnuts out of the fire, but *America*. And at the head of this conspiracy, in full possession of all its secrets stands THE HIGH ADVISER TO THE CHINESE GOVERNMENT, the unofficial head of the Waichiaopu, who confesses in his introductory note to be "mainly responsible for the reports on foreign affairs."

The evidence seems conclusive that the high adviser to the Chinese government, working through the various Chinese publicity bureaus and other organizations, had the American community in China hypnotized, willing to sacrifice the lives of thousands of their countrymen in a terrible war, for the sake of covering up the mistakes and intrigues of a clique of paid international mischief-makers having their headquarters in Peking. There are no laws to protect a nation against damphool sentimentalists and paid propagandists and in the light of the disclosures of the past three years, it is high time the American congress bestirred itself to investigate this situation, and make impossible another such brazen plot to plunge the country into war.

There is no excuse for Mr. Simpson's ignoring of vital truths and building up his case on evidence he hoped might pass without challenge, for on page 193, he gives the text of the treaty of alliance between China and Russia of May 1896 as submitted to the Washington conference by the Chinese delegation after Secretary Hughes proposed that all such secret committments be filed. That China was not prepared for this is clearly intimated by Mr. Simpson, who tells us that the delegation obtained the text of this treaty by telegraph from Peking. This admission is proof that the Chinese advisers hoped to further conceal this document and hazard their case on its being forgotten. Mr. Simpson admits there was ample evidence during 1900 that both China and Russia were acting in terms of the secret understanding, several clauses of which had been duly executed. He acknowledges that it was in force during the Russo-Japanese war, and that if Russia had invoked Article 3, it would have meant the difference between defeat and stalemate. In view of this, it is inconceivable how such a clever advocate, could hope to carry conviction, by ignoring the basic evidence in the case.

Towards the last, in his summing up, Mr. Simpson drags himself out of the mire and muck of Oriental intrigue shakes the kinks out of his twisted pedestals and proclaims one more basic truth when he says:

"I AM THOROUGHLY CONVINCED THAT THE BLOOD-STAINED HEIGHTS OF PORT ARTHUR WILL NEVER BE SURRENDERED AND THE TERRITORIAL LEASE CANCELLED UNTIL THE PART THEY PLAYED IN DESTROYING RUSSIAN IMPERIALISM HAS BEEN FULLY AND ADEQUATELY RECOGNIZED BY CHINA IN MESSAGES TO JAPAN."

Exactly. Here speaks the true Far Eastern expert. This one paragraph almost absolves Mr. Simpson for the many errors he is guilty of in his most interesting contribution to Far Eastern history. Why could he not have commenced with this truth and built up his argument along these lines? Why should he not now begin to educate the Chinese to this wholesome fact? Why continue to surround his clients with a halo of his own making, screening their shortcomings, while reviling his own country and Japan for defending themselves against China's secret diplomacy?

If Mr. Lenox Simpson is an honorable gentleman and adviser, it is duty to the people whose government holds him "mainly responsible for the reports on foreign affairs," to undo his mistakes and strive to implant in the minds of the Chinese that Japan is their friend, that Japan saved Manchuria in 1905 and restored their sovereignty over a vast territory which by all laws of war they had forfeited. If Mr. Simpson, will now contribute his knowledge, his literary and political talents to bring about a solid and lasting understanding between China and Japan by urging the

Chinese to act upon his last statement, then indeed may the world hope for a proper solution to the Manchurian problem. He may then look back and be grateful for the iron training of his old chief and even aspire to outshine the great I. G. in prestige.

Reverting to pedestals, it would seem that all those who did not agree with or accept the formulas of Putnam Weale or insisted upon proper inquiry, came in for an inspection of their extremities. In the case of Sir John Jordan, although no reference is made to his legs or feet, their characteristics according to Putnam Weale's rule of thumb may be inferred, when he says that Sir John "had few ideas and always hoped for the best when his actions were producing the worst." Knowing how long Mr. Lenox Simpson was in disfavor with his own legation, it would indicate that this alleged paucity of ideas and "veneration for the foreign office," arose from Sir John's refusal to accept the false premises and formulas of the expectant adviser on foreign affairs. When we recall that it was Sir John Jordan who told the China Association last year that "nearly all of the trouble that has arisen in China since 1895 was due to Li Hung-chang's diplomacy," it is not difficult to understand why Putnam Weale and the distinguished representative of his country could not agree.

Now the facts would prove that Putnam himself is most prone to the influence of others and has accepted or invented the Chinese formula of how their troubles started, without proper inquiry. However, if he follows his latest hunch and restores friendly relations between the two nations he has labored for so long to part, he will become the greatest of China's many high advisers, and there is little doubt that a grateful sovereign on some of his many birthdays will affirm the premature accolade of T. P. O' Connor in the house of commons. We will be the first to acclaim "Sir Lenox" and wish more power and symmetry to the present somewhat battered and twisted index to his political acumen.

The Crime Against America

The Conspiracy Hatched in Peking to Railroad the United States into War with Japan

AN APPEAL TO AMERICAN EDITORS AND PUBLIC OPINION TO DEMAND A CONGRESSIONAL INVESTIGATION INTO THE ORIGINS AND RAMIFICATIONS OF THE PLOT TO FORCE HOSTILITIES IN THE PACIFIC

* * *

THE UNITED STATES HAS BEEN PLAYED FOR A SUCKER.—The evidence presented in the foregoing pages reveals the existence of a deep laid plot hatched in Peking to force the American people to take up arms against Japan in order to right the grievances of China against that nation.

A repetition of the horrors of the war in Europe was to have been brought home to the peaceful and unsuspecting people of America in order to support the immature and grossly partial conclusions of a group in Peking posing as experts on Far Eastern affairs.

Had it not been for the sober common sense of such men as Judge Elbert Gary, Mr. Thomas Lamont, and other equally patriotic leaders of American finance and industry, who at the very beginning of the agitation, lent their moral support to the counter campaign which culminated in the Washington conference, the agents of Armageddon would have succeeded in their devilish plans.

The story is a long one. The main facts are known. The recent book of B. L. Putnam Weale provides the key that makes clear what lay behind the recent war scare: it helps us to understand the inner workings of the Japanese boycott, the campaign for the cancellation of the Anglo-Japanese alliance and the agitation in Shanghai threatening British trade with similar reprisals; it explains the questionable methods employed in disseminating literature, calculated to fire the hearts of Americans into being the goat for China; it explains many other things.

Dr. Paul S. Reinsch in his letter of resignation to President Wilson calling for a "show down" with Japan, stressed the part the American navy could have taken in calling Japan's bluff and declaring that "Japan would be absolutely powerless in the face of a stoppage of commerce and a navy demonstration on the part of any one of the great powers."

This provided the plotters with the opening to abuse American sympathy, and we find Mr. Lenox Simpson saying the same thing in another way. "THE ULTIMATE PUNISHMENT WHICH SOME HAD SEEN FOR THEM (THE JAPANESE) IN A RIGID BLOCKADE OF THEIR COASTS BY AN ANGLO-AMERICAN FLEET, SEEMED TO HAVE DRAWN PERCEPTIBLY NEARER." His further revelation of the plan of campaign which provided for an alliance between China and the United States in which China would offer her naval bases to the American fleet together with the naval scheme for the defence of the gulf of Chihli pending American mobilization is convincing evidence that the indiscreet publication of Dr. Reinsch's letter of resignation was seized upon to push forward the plot.

The American ambassador at Tokyo, acting on instructions from Washington, categorically denies on behalf of the American government that it possesses any knowledge of the great Sino-American naval scheme drafted by the plotters in Peking. Yet the Americans in Peking were on the most intimate terms with everybody prominent in this conspiracy. Somebody blundered; somebody should have discovered this plot and informed the government, but from all appearances they were hypnotized, lulled to sleep by the flattering attentions of those who were using them as dupes.

If it was not criminal in its larger aspects, such a scheme would be grotesque, a mirth provoking joke, one which would have lured the American army across the Pacific, and even if our transports ever reached the Chihli Gulf, they would have found on disembarking—another Daiquiri.

We cannot, however, ignore the revelations of Mr. Lenox Simpson. He occupies a high position in the Chinese government. He communicated this secret plan to the prime minister of Canada in his official capacity. Where then were the Americans in Peking while this great plot against the peace of their country

was being hatched by the Chinese general staff? With an ex-American minister in the employ of the Chinese government as high political adviser; a retired American naval officer and former naval attache at Peking acting as marine adviser to the Chinese government, and a staff of diplomatic, army and navy attaches and a wonderful intelligence organization on the job every minute of the time, in close laison with Chinese officials, a plot was hatched under their very nose to force their country into war with Japan and they knew nothing about it.

A striking commentary on the working of this system is seen in the recent publication of Mr. Simpson's full confidential report to the president of China on the carrying out of his mission in the columns of the "Tientsin and Peking Times," a British newspaper published at Tientsin, from which it must be inferred that if the document was not released for publication by the chief executive of China, it must have come from the author. We understand it was stolen. Remarkable how easy it was for this British journal to obtain a stolen document, when the parties most concerned, were maintained in such profound ignorance of the original plot. This, in Peking, notorious for its facilities to obtain confidential information. This, in itself, establishes a community of inside interests that should merit and hold the attention of all honorable Americans interested in the welfare of their own country.

We do not wish to be misunderstood. From such knowledge of the facts as we have been able to piece together, the truth stands out in flaming letters a mile high, that this great international conspiracy, this super inter-allied board of strategy sitting in Peking so secretly, that the American legation knew nothing about it, had prepared a scheme that would have held the fort until AMERICAN MOBILIZATION. Mind you, not BRITISH mobilization.

And from the evidence so far presented, the president of the board in possession of the secret plan of campaign, and employing it as an argument to advance his mission abroad was . . . BRITISH. In the operation of this great triangular alliance, the Americans were the poor suckers who were to have pulled the chestnuts out of the fire. And we wish to say to our British readers, right here, that in making this statement, we are satisfied that these methods did not meet with the approval of the great mass of honorable Britons in this part of the world, or their government. This is proven by the reception given to Mr. Simpson in London.

The high points in the campaign are now before the world. It remains for an official investigation to piece them together and report the facts to the people of the United States, in order to show how they have been made the dupe of dangerous agitators appealing to their sentiment and sympathies by a perversion or a concealment of the main facts in the case.

It will be found that a group of fanatical anti-Japanese agitators were implicated in a conspiracy whose ramifications extended to other countries and whose dupes and tools occupied exalted diplomatic and governmental positions.

The evidence is officially before the world that the secret Sino-Russian alliance of 1896 found its logical aftermath in the Anglo-Japanese pact: that it opened Manchuria to Russia for the sole purpose of enabling this power to crush Japan: that it provoked and precipitated the Russo-Japanese war, to that date the most terrible conflict the world had witnessed: that its secrecy was so well guarded that even Chinese officials were ignorant of its existence: that China emerged from the conflict as the innocent and injured victim: that notwithstanding her part in an alliance which compelled Japan to make such bloody sacrifices, her sovereignty over her surrendered territories was restored, after it had been forfeited by all the recognized laws of warfare.

American policy in Manchuria has been based on the assumption that Japan was the aggressor, that she had no right to claim a special position after the sacrifices brought about by the secret diplomacy of China. The United States has been brought into the controversy by reason of the note of our government of May 16, 1915, and the wires are now being pulled to have us intervene in the question of the cancellation of the lease in March of next year.

The statement of the highest living Japanese authority is also before the world, and although it convicts him of having been tricked by Yuan Shih-kai, it tells us that the much denounced ultimatum which followed the twenty-one demands was specially requested by the Chinese government in order to save its face before the nation, a secret deal to obtain Japan's recognition of Yuan Shih-kai as emperor of China. For seven years this fundamental and most important evidence has remained a profound secret, and only when faced with the prospect of having the Manchurian lease declared null and void, does the truth come out.

Because of the secret diplomacy of Li Hung-chang in 1896 and Yuan Shih-kai in 1915, the sympathies of the American people have gone out to China, and have been played on to the point where we were to have been railroaded into war.

Mr. Bertram Lenox Simpson, the British high adviser to the president of China, the unofficial head of the Chinese foreign office "in charge of the reports on foreign affairs," confesses to having been sent on a secret and official mission to use his own methods to bring about the cancellation of the Anglo-Japanese alliance, and in pursuit of this object, reveals the plot that was all prepared to make the United States and China allies in the war with Japan. There is no evidence that the details of this plot was communicated to the SUCKERS, but it was fully and confidentially imparted to the premier of Canada, in order to influence his policy at an imperial British conference.

The story is almost complete. It remains for an official investigation to establish the facts and ascertain the identity of the misguided patriots who had so far compromised the nation as to lead the Chinese to believe we would enter into a treaty of alliance and use their ports as naval bases. The Chinese must have had some assurance that we would ally ourselves with them. Who is responsible for this secret diplomacy that would have carried sorrow to thousands of American homes and used the youth of America for cannon fodder to bolster up their schemes? The American ambassador at Tokyo has categorically denied that the American government had any official cognizance of the scheme for the defense of the gulf of Chihli. This statement tells us that the plot was hatched in Peking. By whom?

If the editors of America will make this clear to their readers, the howl of indignation that will go up from end of the land to the other, will force the government at Washington to take steps to ascertain the truth. LET US DEMAND THE FACTS!

* * *

A permanent peace in the Pacific can be firmly established only upon the secure basis of Sino-Japanese friendship. As long as misunderstandings exist between these two great Asiatic nations permitting international mischief-makers to ply their professions in Peking, the United States is in constant danger of being embroiled in war with Japan.

Secret diplomacy, truths half told and partisan propaganda will continue to breed suspicion, engender hate and promote strife. The great work of the Washington conference will count for naught while such conditions endure. The road to Pacific peace, the foundation upon which the stability, development and prosperity of China must be erected, the key to the expansion of foreign trade and the opening of immense markets, is a *rapproachment* between China and Japan.

The first step towards this goal is the recognition by China of her part in plunging Japan into a struggle for her national existence; to that date the most disastrous and bloody war in world history. The frank acknowledgement on the part of China of Japan's disinterested friendship in restoring her sovereignty over her lost Manchurian provinces, is the *sine qua non* to a settlement of the last outstanding point of disagreement between these two nations.

Japan is not the agressor in Manchuria. Japan is sincere in her oft expressed desire to reach an amicable and lasting understanding with China. Japan has no intention to further impair the sovereignty of China in Manchuria, recognizing she is there as a lease holder only. If we interpret Japanese opinion and policy correctly, they are even willing to forego certain phases of the leasehold rights and surrender jurisdiction over Kwantung and the railway zone WHENEVER CHINA PROVES STRONG ENOUGH TO DISCHARGE HER INTERNATIONAL OBLIGATIONS IN THESE REGIONS. Until such time, the mutual defense, the co-existence of both countries demands the presence of a power in Kwantung that will guarantee not only the integrity of China but safeguard the vital interests of Japan. The formula that justifies British occupation of Kowloon and the American-Nicaragua treaty, covers Japan's occupation of Kwantung pending such time as the legitimate owner of the territory can guarantee that her national existence will never again be placed in jeopardy.

American public opinion, American diplomacy and common sense can prevail upon the Chinese to exercise sound judgement and repair the breach in their relations with Japan. Through the operation of a secret diplomacy in which neither the people or the present officials of China can be held responsible, the seeds were sown which ripened into one war. The secret diplomacy of Yuan Shih-kai and the still more damnable secret diplomacy of the Peking Camarilla nearly precipitated a greater one. Only by heroic efforts was this last catastrophe averted. Let us put a stop to conditions which enabled a small clique of misguided foreign enthusiasts in Peking to devise plans of campaign and draft secret alliances which almost precipitated America and Japan into hostilities. American editorial and public opinion, brought to bear on the right quarters in Washington, can do it. It is the only way.

GEO. BRONSON REA.

British Engineering Trade in China and Japan

"The Eldorado of The Far East"

IT is seldom that we tender advice to our British friends in trade matters, but in view of the somewhat strenuous campaign now being carried on in England to induce British firms to establish themselves in China, it may not be out of place to invite attention to facts which are obviously overlooked. From the many newspaper clippings which come to us from London, it is clear that the same tactics are being employed to influence British traders to come to China as were so successful in the similar campaign which flooded Shanghai with over 300 new American concerns two years ago, and whose inexperience precipitated the financial catastrophe of 1920.

It seems to be taken for granted that the road to commercial success in China is to increase the number of foreign firms already in the country, or, to employ the slogan of one of the American boom agencies, "in numbers there is strength: only by outnumbering the others can we hope to succeed. Come on in boys, the water is fine." And the Americans came in with a whoop, wetting their feet first, then walking in deeper and deeper, until they got over their head, went under and rose no more. The old established hongs of Shanghai paid the price for the activities of self-styled trade advisers who had nothing to lose themselves and everything to gain by increasing the number of firms in the treaty ports. It cost the established firms many millions of dollars or pounds for this campaign to pad the Hong Lists.

During the war, when British firms were practically unable to hold their own, there was some justification for the influx of new American firms into the China field, but it stood to reason that as soon as normal conditions returned, the firms not firmly rooted in the country would be compelled to shut up shop. This happened. Now there may be room for many new British trading firms in China, nevertheless, we incline to the belief that until conditions improve and a stable government once more guarantees life and property, any campaign to flood the country with new firms is not only prejudicial to the interests of established hongs, who have a hard enough time as it is, but a positive invitation to further financial disturbances.

Typical of the articles now being printed in England regarding the possibilities of the China market is one in *The Times*, entitled "The Eldorado of the Far East." The writer says that the "China trade is straining at the leash, eager to bound ahead. It needs but a turn of the political wheel, and a little improvement of the general situation, to open out a new and magnificent vista of trade opportunity." After a general *resumé* of trade returns which indicate the extent to which British trade may prosper by paying more attention to Chinese markets, he concludes by saying, "it depends upon the intelligence and enterprise of British traders to make good in this Eldorado of the Far East." The identical catch phrases which lured the inexperienced American trader to ruin two years ago.

It is true that prosperity in China needs but a turn of the political wheel, but the impulse that will make the wheel go round and bring stability to the government in Peking, is a large foreign loan, which may or may not accomplish its object. It is just possible that the hearts of the British investor are being fired to subscribe to the forthcoming Chinese bond issue which British papers inform us is a possibility. There is every evidence from reports in the British press that an independent Chinese loan advanced by groups outside the consortium is meeting with favor, and that considerable dissatisfaction prevails over the consortium pact which has prevented the flotation of a loan to the Wu Pei-fu faction. If the trade boom campaign now being carried on is part of the propaganda to pave the way for the successful issue of such a loan, the British investor might well seek more positive information about conditions here, from firms already on the ground. Although we do not always agree with the Hearst editorials the following from the *New York Journal* of October 2, is not without its significance:—

"China is borrowing ten millions from bankers at Peking and elsewhere. Out of that the Chinese government will get eight million dollars. The bankers that float the loan will get TWO MILLION GOOD DOLLARS. The investor will get CHINESE BONDS. It is pleasant for the bankers. They get their two millions, for instance, out of this Chinese loan, peddle out the bonds and THEIR risk is ended. It is pleasant for the Chinese gentlemen temporarily in authority. They get the eight millions, which melt. What about those that buy the bonds? They will get the answer to that later."

At the bottom, the tactics are identical with those employed to enthuse Americans into lending huge sums to the military overlords of China, and now that the American and Japanese group leaders are reluctant to advance these funds to bolster up any particular clique and prolong internal strife, the activities of the loan promoters have been transferred to London. It is possible to completely deceive the public in England as to the real conditions in China as it was in America, provided the boomers are sufficiently high placed and there are newspapers of prestige to publish their

propaganda. Despite the warnings of this publication, the American manufacturer, merchant and investor disregarded its advice and poured into the *Eldorado of the Far East*, and got beautifully trimmed. It cost American firms about $50,000,000 to learn that the China market is no place for unsophisticated griffins. Let us hope that the British trader and manufacturer will not get stung to the same extent, in order to learn an elemental truth that any old retired "China Hand" in London can tell him about.

Our experience in China tells us that British interests are remarkably well served and advanced by the firms already on the ground, and if they have failed to obtain their full share of the orders, it is because of conditions over which they have no control. If British trade, especially in the engineering lines, has declined, it is traceable to the increased activities of Americans and Germans, not to mention the inroads that the Swedes, Czech, Swiss, French and other European manufacturers have made in a market in which before the war they were prominent by their absence. There now exists a fierce competition for the little business that is offering, and at times the British have been unable to meet this new situation. It is futile to assert, as some British writers are now doing, that Americans and Germans have better equipped men on the ground, as we can point to a long list of British machinery firms whose engineers are fully as efficient as their competitors, in many cases experts in their lines, which, added to a long experience in China, gives them a decided advantage over the purely technical representatives of other nations.

In other words, British trade in China has not declined because of inadequate representation or inferior engineering intelligence, but simply because development has been retarded and brought to a standstill as a result of internal political conditions and the chronic inability of the Chinese government to meet its obligations, let alone embark in new construction. Whatever new business has come forward, has, in the majority of cases, gone to their competitors, who are now sitting on the door steps of the Treasury at Peking dunning the minister of finance for payment, while their respective legations are employed as official schroffs. The trade returns may alarm the British analyist who accepts the statistics at their face value, but when permitted to look behind the scenes, he well see that the apparent British loss is in reality a clear gain. They are that much in pocket.

It might also interest British engineering firms and throw light on the situation, to learn that their Chinese railway supply business has diminished in part through the failure of the Chinese government to live up to the spirit of its loan agreements with the British and Chinese Corporation, whose services as purchasing agents have been dispensed with, and in some cases, the business placed through an American firm. All of which may have been strictly according to the literal meaning of the loan agreements, but the British official company certainly was entitled to the preference in this matter, whenever the Chinese elected to make use of an agent for the purchase of materials on the lines involved. Several very emphatic protests were lodged by the British and Chinese Corporation and by the British legation against this ignoring of their rights, but as usual, they received no attention. As much of the equipment that might possibly have been ordered from British manufacturers is still unpaid for, there may be some small modicum of satisfaction in contemplating a loss of business under such circumstances. The London office of the British and Chinese Corporation might throw some light on this matter for the benefit of British engineering groups who feel uneasy over their prospects in China, and turn dejection into gladness.

British Trade With Japan

As in China, so in Japan. The same arguments are employed in the British press to explain away the loss of their trade with Japan in engineering supplies. A typical article of this nature is found in the editorial columns of *The Engineer* of October 13 ulto. The facts surrounding the situation are set forth as follows:

"If any English engineer will take the trouble to turn to a report on the commercial, industrial and financial position in Japan in the year ending June 30, 1921, recently issued by the department of overseas trade, he will be struck by two facts of much consequence to himself. In the first place, he will perceive that whilst in the years immediately preceding the war the United Kingdom supplied Japan with 40 per cent. of her requirements in iron and steel, in the year 1920 the proportion had fallen to 23 per cent. On the other hand, America in the same year increased her 15 per cent. to no less than 75 per cent. of the total requirements of Japan in iron and steel in the same year. That is a striking and uncomfortable contrast which cannot be lightly explained away, for it is confirmed by other figures for the total commerce of Japan with foreign countries. Before the war the United Kingdom enjoyed 31 per cent. of that trade and in 1920 that figure had not altered, but the United States, which used to stand second with 22 per cent., had advanced to the first place with 33 per cent. This increasing influence of America in the trade of Japan is the first fact that will strike the reader. The second is that at the time this report was written the influence of Germany was so small that it receives no attention at all—there is no mention whatever of the efforts of the Germans to re-establish their trade with Japan. At first sight, this might appear to be a matter for congratulation; but it is, indeed, just the opposite. Germany is now energetically at work in the Far East, with the result that we have not one active competitor to face, but two. In China the same competition has to be met. The position of the United Kingdom is no longer unchallengable. The United States and Germany are making every effort to undermine it, and nothing but a campaign carried on with all the energy we can command will prevent the repetition in China of the condition exhibited by the figures for Japan which we have quoted above."

In seeking for the causes of a state of affairs which gives rise to British uneasiness, *The Engineer* is inclined to give undue prominence to the current criticism that British engineers are not up to the high standard of efficiency and deportment that characterize their competitors, and concludes by saying that:

"If British firms neglect this policy, if they leave it to America and Germany to be represented in China and Japan by the best men, if those countries become habituated to turning to our rivals for technical help, then we shall unquestionably see a trade, which has already sadly fallen, diminish further, and the splendid reputation for engineering which this kingdom has enjoyed in the East will dwindle away."

It is with no desire to be controversial that we inject ourselves into a discussion that is purely a British family concern, but we feel warranted in inviting the attention of British engineers to the working of a fundamental economic law which seems to have been overlooked in seeking for the reason of their trade decline with Japan. It is axiomatic that a manufacturing nation who consumes the larger part of the exports of another nation is in the most favorable position to supply its imports. This explains why British machinery has been displaced to a large extent by American equipment in Japan. The world war brought great changes in old established trade conditions, and as a result America and Japan were brought into a very intimate commercial relationship. To quote the above figures, America's total trade with Japan in 1913 was only $150,000,000: in 1921, it reached $550,000,000. American imports from Japan in 1922, largely raw silk, approximated $300,000,000 while our exports to Japan, largely raw cotton, were valued at $245,000,000. In the interchange of these staple commodities, Japanese firms to the number of seventy, established offices in New York city, with all the most up-to-date commercial machinery to assist them. Six Japanese banks, several insurance companies, and steamship lines, a special financial agent of the Japanese government, purchasing offices of the government railways, the army and navy departments, the South Manchuria Railway and other concerns have established offices in New York city. It is natural that they should place their orders for machinery and other requirements in the country whose trade makes these purchases possible. For instance, as noted elsewhere in this issue of The Far Eastern Review, the great Mitsubishi firm alone purchases annually over $50,000,000 of American products through their New York office. It is difficult to change this situation as the mainstay of their business is the buying and selling of the two great staples. The rest follows naturally. The situation is somewhat similar to that which gave to British trading firms their pre-eminence in the Chinese engineering field. The prosperity of old established hongs is based primarily on the interchange of staple products and their engineering departments were built up on this solid foundation of trade which enables them to weather through when other engineering concerns are hard hit. As long as this close trade relationship exists between Japan and America, it seems natural that American machinery manufacturers will remain in the most favored position to supply Japan with the greater part of her engineering requirements. The perfect understanding that

exists between Big Business in both countries will undoubtedly strengthen the bonds of friendship as the years go by and make it increasingly difficult for other nations to compete. The foregoing explanation will help also to explain why the principal financiers and captains of American industry determined in 1919 to use all their influence to check the agitation to precipitate war between the two countries.

These, therefore, are the basic reasons why British engineering trade with Japan has decreased from 40 per cent. of the total in 1913 to 23 per cent. in 1920 and why America increased her 15 per cent. to 75 per cent. of the total in the same period. It is no reflection on the quality of British material or the ability or social qualifications of their engineers. The British engineer in Japan is simply up against the operation of a fundamental economic law that no amount of propaganda can offset. On the other hand, it speaks volumes for British enterprise that their agents and engineers in Japan have been able to secure some of the most valuable orders in the face of a situation which gives to their American competitors such a favorable advantage.

If the bulk of the business has gone to the United States, it should be borne in mind that the great majority of these orders are placed direct with American manufacturers through the New York offices of the large Japanese firms, who, by reason of their huge purchases, intimate connections, and knowledge of market conditions are enabled to obtain the lowest possible prices and assure quick dispatch and facilitate financing. When viewed from this angle, it would indicate that at least fifty to seventy per cent. of the engineering business of Japan is of a nature that precludes general competition on the ground and automatically sends the inquiries and orders to New York. This also a situation over which the British engineering representative in Japan has no control.

G. B. R.

The Fatuous Policy of the Chiaotungpu

(Contributed)

THE Chinese government official has always been credited with a somewhat superior skill in the conduct of machiavellian policy and with a thorough knowledge of the psychology of the hapless "stupid people" under his control. If this is still a general rule, the officials now responsible for the railway policy of the government are most woaful exceptions. In the recent labor troubles they utterly discredited the one government department able to boast a policy not entirely opportunist.

In the past, this department learnt a costly lesson in the futility of listening to popular clamor raised in defence of national integrity over the question of the Hangchow-Ningpo railway loan. With the streets of Peking and their bigger cities furnishing occular evidence of the degradation of Russia as a result of the adoption of Bolshevist ideals, the railway officials now yield to a mob infected with the same dangerous principles, and making demands which will have consequences infinitely more far-reaching.

Labor so abysmal in its ignorance was bound to misinterpret an easy victory, as the Chinese official of experience was well aware. Compromise is the immemorial basis of settlement of all disputes in the East, and demands are framed in expectation of it. Yet no attempt was made at compromise. Labor's demands were conceded practically *en bloc* with the inevitable result that more demands will be made. Such a victory teaches nothing, and only breeds arrogance in the ignorant.

As a result, the government which should do its utmost to encourage and protect private industry, has involved the employers of North China in a labor war which threatens their existence. The government, already sufficiently harrassed financially has now to meet a vastly increased expenditure as a result of granting these ridiculous demands. Lastly, such a policy can only end in bankruptcy and control of the railways by foreign creditors, a result doubtless to the benefit of the nation as a whole, but entirely opposed to the ideals of a government always highly sensitive on the subject of national integrity.

On every count, domestic and foreign, the recent policy of dealing with Chinese labor was utterly mistaken. A parade of the forces of law and order, insistance upon immediate return to work with a promise to consider the grievances as represented by delegates, imprisonment for the agitator, who, not from conviction but for a price, teaches a people mentally blind, as yet, to cry for a moon they cannot even see ; these should have been the measures adopted for calming the first outbreak of industrial unrest in the North. Had these expedients failed, as assuredly they would not, there remained the application of armed force for the intransigeant minority who would ruin China far quicker even than the rival oligarchies, and their hordes of drone soldiery. The only satisfactory aspect of the present situation is that China is industrially an infant, and may perhaps, as a result of this colossal blunder, advance a step in that hard school of education to which national conceit condemns her. There is, however, even a doubt about this, for China's memory for the really vital, and educative pages, of her history is about as short as her memory for monetary or moral obligations.

Apart from this vital question, there is an apparent slackness in the conduct of the railway department of the board of communications. Presumably those who direct its affairs fail to study the very comprehensive report, the yearly *chef d'œuvre* of the department. If the statistics for the years 1916 and 1919 are contrasted they will provide unpalatable reading for those who stridently aver that China has now reached a stage of self-sufficiency in all things. During the four years considered, the annual increase in kilometreage was 134 kilometres. This in itself, is a singularly poor record for a country whose existing main lines are in urgent need of development, quite apart from the crying need of better communications generally. Such building as is done gives no indication of a systematised development of the trunk system ; there is no yearly program, not even the farce of its discussion. Years of war and lack of funds, will be advanced in extenuation, but surely with a surplus running as high as 30 million dollars, something may be snatched for systematic construction not limited by the strategic ideas of tuchuns or the official with capital to invest.

Again, it will be found that train density in the years considered has remained stationary at 11. Therefore the added kilometreage should call for no practical increase in personnel as regards the traffic and locomotive departments. The engineering department, taking the very high figure of four men per kilometre, would account for an additional 2,160 men for the 540 kilometres increase in the four years considered. Yet it will be found that the number of railway employees increased by 13,794 in the years 1916 to 1919. The railways are then in need of the economising axe, most urgent in these lean years. It might be advanced that increased rolling stock demands an increase of employees, but wagons per kilometre in 1916 stood at 1.92, in 1919 at 1.88, while locomotives were 0.116 and 0.115 in these two years, a condition indicating a practical *status quo*, and at the same time advertising the poverty of equipment as contrasted with railways elsewhere in the world. Thus two of the Indian railways were equipped in 1918 as follows, and they carry a rather less tonnage than the Chinese lines :—

	Engines per k.m.	Wagons per k.m.
Bengal Nagpur.. ..	0.17	5.0
Bombay Baroda ..	0.18	4.4

Again, for the benefit of those for whom figures have no appeal, and for those who will have it that statistics may be made to prove anything, I would present the following facts. At two ports in Northern China may be seen piled up in the manner of a railway accident the parts of some four hundred cars. These have lain there at least a winter and a summer, detained, it is said, for non-payment of duty, more probably deposit default to the makers. Originally, these parts were in packing cases. The cases, however, have a past and a future as fuel, while local brass founders and blacksmiths will surely not overlook the more portable plunder in these forgotten and unprotected heaps. With the urgent need for rolling stock, what can be said of railway management which allows such things, especially when it is considered that every ton of car capacity in these dissolving rusting heaps, is capable of earning a yearly income of at least 168 dollars per annum.

Again, as applied to the question of improved communications generally, it is pertinent to ask whether any steps have been taken to metal the 800 odd miles of roads presented to the country by the American red cross, or whether these have been left uncompleted to the tender mercies of the Chinese country cart which will rapidly deprive them of potential utility. Also, in this connection, one wonders at the apathy of a government which still abandons to almost yearly inundation a considerable portion of northern Anhui for lack of reclamation and conservancy work of the Huai River, which in the long run, would prove a source of income.

It would thus appear that the publication of expensive railway reports only serves at present to lay bare ineptitude, and to demonstrate the fact that revenue is increasing at a somewhat greater rate than extravagance; a fact worthy of consideration to a government in pressing need of money.

Reverence for the past and its traditions is accounted a national trait. Those now controlling the board would do better if they turned again to the old wisdom for guidance as set forth in such pithy proverbs as: "The error of one moment becomes the sorrow of a whole life." "Those who cannot be unheeding sometimes are not fit to rule."

Something of mob psychology might have been learnt from the following sayings:—

"A vacant mind is open to all suggestions as the hollow mountain returns all sounds."

"Better be a dog in peace than a man in anarchy."
"To obtain one leads to asking for two."
"Good fortune is a benefit to the wise; a curse to the foolish."
"To stop the hand is the way to stop the mouth."

Lastly, for the benefit of the iconoclast young man who tends more and more to assume responsible positions in the government, I would quote, "who swallows quick can chew but little," and assure him that the present conduct of affairs will not bring about that eminently desirable state which is summarised in the saying "no duns outside, no doctor within." In mitigation of their undoubted deficiencies, it may be advanced that the Chinese cabinet minister is no sooner in the saddle than he is out of it that he is blinded and deafened by the perpetual crash of falling ministries and the bustle of their re-constitution. Then let him hearken to the hoary old saw which decrees that "The onlooker is often the best judge of a game." There is criticism enough in all conscience. The past has provided adequate guidance and this wisdom is in the mouth of every educated Chinese. Long live the past!

Vast Water Works Extensions in the Far East

Manila and Singapore to Increase Water Supply

IN line with harbor and public utility improvements throughout the Far East, the expansion of existing water works is being taken up in all the principal cities of the Orient. From Tokyo to Singapore plans are being drawn for large water supplies for the various important centres and the near future will see several large projects sanctioned and started. In our October number appeared articles on the Osaka and Hongkong expansion schemes and we have since received reports on the programs for the extensions of the Manila and Singapore water supplies.

The Manila Project

The urgent necessity of an increased water supplur system for the city of Manila was forcibly brought out by A. Gideon, manager of the metropolitan water district, at the weekly luncheon of the American chamber of commerc of Manila on Wednesday, October 25. Mr. Gideon has been connected with Manila's water supply and sewer systems for 19 years and is the father of the metropolitan water district.

Mr. Gideon briefly traced the development of the Manila water supply system. About 200 years ago a Spanish general by the name of Carriedo left P.10,000 in a trust fund to be used for water supply purposes. By 1880 this fund had grown to P.200,000. despite the serious drafts that had been made on it by none too scrupulous people. A project was finally decided upon after ten years of investigation and it was found that it would cost P.1,200,000. To raise the extra money a tax on milk was instituted. Finally the pumping station at Santolan was installed with two pumps. When the Americans came, two more pumps were added. This system yielded 5,000,000 gallons daily, but was soon found to be inadequate.

In 1900 the city of Manila utilized its whole borrowing capacity of P.8,000,000 and constructed the present water supply and sewer system. This system, with its dam at Montalban, should be capable of impounding an immense quantity of water, theoritically, but, unfortunately the limestone of the reservoir basin is leaky and two years after the reservoir was filled up a leakage of 27,000,000 gallons a day was discovered. Since then many of the seams have been tightened up and other remedial measures have been taken, so that the loss has been reduced to 9,000,000 gallons daily.

Mr. Gideon stated that he has been urging a new source of supply since 1911. In 1918 he went direct to the governor general and outlined the metropolitan water district, so-called because it is not only designed for Manila but for all the neighboring towns. In 1919 the district was established. Up to then the water supply had been run at a nominal profit but at an actual loss of between P.250,000 and P.500,000 a year, the discrepancy being due to faulty accounting methods. The district had no funds in the treasury at the start. A credit of P.500,000 was, therefore, authorized for operating expenses. This money was not touched and there is P.1,000,000 in the treasury to the credit of the water district.

Mr. Gideon maintained that the number of water services is an accurate index to the prosperity of the city. He presented the following figures in this connection:

Year	*Services*	*Income*
1903	2,000	P.200,000
1918	8,000	625,000
1922	14,000	1,250,000

Mr. Gideon was very emphatic in his advocacy of a new system and declared that he hated to contemplate the possibilities of the

next dry season or the one after that unless additional provision for water is made.

Three projects, he said, have been under consideration. The first is the development of the present Montalban reservoir. This, however, is impracticable on account of the impossibility of making the basin watertight. The second, in the Boso-Boso watershed, would require the construction of two large dams and the building of a new pipe line. Its costs would be about P.13,000,000. The third, and the one most favored, is that of the Angat river in Bulacan province. It would necessitate the construction of a low dam, only 50 feet high, and the water would be brought to the city by tunnel. The capacity of this project would be 80,000,000 gallons a day, which ought to take care of Manila's needs until 1980, according to Mr. Gideon. Manila is using about 2,000,000 gallons a day now. Mr. Gideon has worked out a practicable financing scheme for the Angat project. He is opposed to a hydro-electric development proposition in connection with the latter on account of its excessive cost.

Although this proposed extension is still in the air, there is little doubt that necessity will compel the adoption of some plan in the near future which will assure to Manila an adequate water supply.

Gunong Pulai Water Scheme, Singapore

At meetings of the Singapore municipal committee No. 6 held on October 9, 13 and 18 it was resolved to recommend

(A) That Sir Alexander Binnie, Son and Deacon's report on the Gunong Pulai water scheme for supply of 6½ million gallons per day be adopted.

(B) That Sir Alexander Binnie, Son and Deacon be appointed consulting engineers for design and construction of the scheme at a fee of £97,500, covering a period of six years from date of furnishing of drawings and specifications, the said firm undertaking to keep one of its partners in residence in Singapore.

(C) That the commissioners agree to Col. Pearson, engineer-in-chief, ante-dating the termination of his agreement with them from November, 1923, to August to September, 1923, with a view to his entering into partnership with Sir Alexander Binne, Son and Deacon and to his undertaking on behalf of that firm the duty of consulting engineer in residence.

This scheme as noted above, will produce 6,500,000 gallons of water per day at a cost not greater than £1,650,000, and we find here a duplication of the difficulties surrounding the colony of Hongkong in securing an adequate supply of water within the confines of its own island. As Hongkong is forced to seek its future supply from the main land and have it piped under the harbor from Kowloon, so Singapore must also go across the Johore Strait for its water, and for this reason the Gunong Pulai scheme is recommended as the only solution to Singapore's problem.

Commenting on this scheme, the *Malaya Tribune* says that " Such an increase looks substantial, but let it be remembered that the present position is " precarious," and that within quite recent memory an unusually prolonged absence of normal rainfall brought a water famine within uncomfortable distance. Actual daily consumption in 1921 was 10,057,000 gallons, and that quantity was in excess of maintainable yield from existing sources. In other words, shortage of supplies was only averted by a providential rainfall which it was not safe to count upon.

Turning to the future—and remembering that over ten million gallons were consumed daily in 1921—let us consider the prospects. Basing conclusions as to increase of population and of water consumption on calculations which experience has shown to be reasonable, by 1951—29 years from now—three will probably be a population within the Singapore water area of 658,200 (compared with the 333,266 of 1921); that is, the population will have nearly doubled. Allowing 35 gallons of water per head per day, the consumption will then be 23,037,000 gallons daily; allowing 40 gallons per head, it will be 26,328,000 gallons. And whilst Colonel Deacon thinks that 37 gallons is a sufficient daily allowance per head of population (the 1901 figure was 21.7, the 1920 figure 32.9), the points out that the increase shown in the past few years is due both to greater domestic use and to trade development.

With the Gunong Pulai supply duly available—and Colonel Deacon insists upon the urgency of commencing operations to make it available as soon as possible—" there need be no anxiety for many years to come "; and his opinion that this is the most economical of the several schemes put forward commands respect.

* * *

Looking Ahead a Quarter of a Century

Russo-Germanic Designs in Europe and Asia

ONE of the most influential publications of the United States is *The Manufacturer's Record*, of Baltimore. It reflects the sentiment of the great commercial and industrial interests of the Southern States, whose prosperity is closely interwoven with that of the great British textile industries. After reproducing the gist of the editorial entitled " Up to Northcliffe," published in the July issue of THE FAR EASTERN REVIEW, *The Manufacturer's Record* says:

" *The North-China Daily News* has an uncanny habit of unearthing documents disclosing the inner working of Russian policy in Asia. Many years ago it set the chancelleries of the world agog by publishing the text of the Cassini convention, a document which changed the whole aspect of Asiatic politics and compelled Great Britain to move quickly in order to defend her interests in India and elsewhere in Asia. The aftermath of this convention and its corollary, the Li-Lobanoff secret alliance between China and Russia, was the Anglo-Japanese alliance, the Russo-Japanese war and the series of events which culminated in the twenty-one demands followed by the diplomatic blunders which nearly precipitated war between Japan and the United States.

" Once again our contemporary publishes an epoch-making document, purporting to be the full text of the secret military convention between Soviet russia and republican Germany. As in the case of the Cassini convention, the authenticity of the document is in doubt, but it bears the earmarks of truth. In the event of its authenticity being established, history will undoubtedly repeat itself and Great Britain again make quick moves to counteract it, and unless we are greatly mistaken, the first of these will be a renewal of her discarded understanding with Japan.

" By the terms of this secret agreement, Germany will equip, arm and entirely reorganize the Russian army. The German general staff will furnish the red army with the latest inventions in poison gas warfare, will build and equip new munitions and air craft factories, *and the reds are not to interfere with the work of German officers and specialists on the new munitions factories on the border of Afghanistan.*

" No competent observer can fail to see that the reported secret convention is the logical aftermath of the Soviet's first surrender to Germany, and is strictly in line with the news that has dribbled out of both countries for the past three years."

" The information given in the foregoing from THE FAR EASTERN REVIEW is now confirmed by dispatches from Europe, which show that not only have Germany and Russia entered into a treaty, but that Tu key is included in the deal."

"Mr. Moreton Frewen, the well-known political economist of England, sends the *Manufacturer's Record* an interesting letter from Lieut.-Colonel Repington in which attention is called to the fact that the Russo-Turkish alliance of last year has been followed by the Russo-German treaty, and that the known tendencies of Austria, Hungary and Bulgaria compel England to recognize the solidarity among its lately vanquished enemies, and a clearly defined intention of bringing about by successive stages the revision if not the destruction of the peace treaties with the aid of the Soviet government of Moscow."

"Colonel Repington says the Bolsheviks, prompted by Germany, and the Kemalists in second place, recognized early the leverage which they might exercise against the western powers by an appeal to Mohammedan sentiment throughout Mohammedan regions, and they left no stone unturned to excite against England, France and Italy, the Mohammedan people under their sway. The propaganda has been carried on for three years in the allied countries or their dependencies, and everywhere in the underground workings has been seen the hand of the Soviet.

"The Germans wish to bring back the Turk into Europe in order to revive for their benefit the old war combination. The Turk once in Europe, the designing Germans, as admitted by Von Sanders, count on the 26,000,000 Mohammedans of the world to keep the western allies fully employed in protecting their own possessions.

"It is not," says Colonel Repington, "a program for to-day or to-morrow, but for a quarter of a century ahead."

"The congress of Oriental peoples which is to meet next year under Kemalist patronage is part of the picture and it will endeavor to unite all the Orient against the west in a common front, a consummation to which the Germans are looking with great satisfaction. Turkey is to serve as a link between Germany and the whole of Asia. Turkey can count on Russian support as Russia can count on Germany. Those who have traveled through Eastern Europe of late find the indications of this great conspiracy wherever they go."

"Colonel Repington's letter illustrates in considerable detail the meaning of this situation to England and France, and no American study the outlook without feeling that the world is coming to a parting of the ways between civilization and barbarism, and the struggle will be whether barbarism or civilization shall survive.

"One of the best informed and most far-seeing educators in England in a personal letter to the editor of the *Manufacturer's Record* says: "Things are moving on apparently to a vast cleavage between the Christian and Mohammedan worlds. I wonder if Americans know the appalling things that happened at Smyrna. The Turks are just raging to get over the Bosphorus and get after Christians."

"Lloyd George in his address rightly stated the case when he said that England had stood in the breach to save Europe from the onrush of the Turks. Standing thus England has perhaps for the time being saved all European civilization, for if once the Turks can re-enter Europe in power, the rise of the Mohammedan world against Christianity will stagger the world with the awful carnage, of which only the barest hint seen in the destruction of Smyrna. What the Turks did to that city and to the tens of thousands of Christians gathered there, they are longing with a blood lust to do to all of Europe.

"The Almightly alone can see what is ahead of the world, but in the light of this situation disarmament of America or of England would be a crime against humanity and Christianity itself."

* * *

Will Wood "Come Back"?

THE elections on November 7 may be considered as a republican defeat, a disapproval of the present administration forcibly expressed by the American people. It is doubtful whether this reaction is traceable to the republican party's handling of domestic problems or to its foreign policy. The democrats, arraying themselves for the struggle in 1924, have fiercely attacked the foreign policy of Harding and Hughes characterizing it as "supremely foolish" and "a record in foreign affairs of almost unparallelled stupidity," basing their denunciations largely on the failure of the present administration to enter the league of nations. The democrats say that "two years ago the moral influence of the United States was supreme in the world: it was universally recognized that the United States had entered the world war for altruistic and not selfish motives. With the election of Mr. Harding that influence was withdrawn." According to the democratic arraingment "the recrudescence of the militaristic spirit in some quarters of Europe, the existence of large armies, the difficulties of the reparations question—all these things, with their inevitable blight upon the trade of the world, are the direct results of the foreign policy of the present administration."

It begins to look as though the democrats will drag the league of nations issue into the next campaign and lay to the door of the republicans all the woes that have befallen the world and the United States for Harding's failure to adopt the policies of Wilson. The democrats overlook the all important fact that although the last administration may have settled the affairs of Europe to its own satisfaction, it was committed to a program in the Pacific, taken advantage of by international mischief-makers, which would have plunged the nation into war with Japan.

From this horror the republicans have saved the country and permitted it to retain the leadership in world affairs. We may have lost a certain amount of so-called moral prestige because of our refusal to play the rôle of Don Quixote, but on the other hand we would have emerged from a war with Japan bankrupt in finances and once more in a position where our moral leadership would have carried little weight amongst nations whose policies are diametrically opposed to our own. Our moral prestige would not have carried us far in the councils of the league of nations were we shorn of our financial supremacy and the power to back up our opinions. That the United States is still reckoned with as the strongest power in the world is due, not to the Wilson administration, but to the common sense of the republican leaders shouldered with the task of finding an honorable solution to Pacific problems inherited from their predecessors in office.

We give full credit to Harding and Hughes for the admirable manner in which this solution was sought and applied at the Washington Conference, but we also incline very strongly to the belief that their success was made possible in a large measure by the full and frank conversations between General Leonard Wood and the Japanese military leaders in Tokyo in which each side made known their irreducible terms of compromise. Harding and Hughes are entitled to the credit for this great epoch-making event which brings peace to the Pacific, but nevertheless, it was the cold, hard, manner of fact talk between fighting men seated around a table which made its success possible.

Affairs in Eastern Asia are rapidly approaching a crisis.

Leonard Wood has already done great work in the short time he has been in the Far East. He will be called upon to do greater things before his mission in the Philippines is completed.

* * *

Japanese Sewage Systems

OWING to unusual local conditions, the cities in Japan have been slow in arranging for the installation of sewage systems, but reports coming to hand now indicate that Japanese cities will follow occidental practice in these matters. The Japanese premier has approved the proposed program for sewage improvement for Osaka. This sewage system will handle both rain water and foul water, conducting it to cesspools, which will be fitted with pumping equipment to discharge the whole into rivers or canals connecting with the sea.

The problem involves a very considerable installation, which has been carefully designed and involves the placing of pipes, the construction of cesspools, and the installation of pumping equipment. It is anticipated that 40 per cent. of this work will be done in the Japanese fiscal year 1922, a further 40 per cent. in 1923, and the work completed in 1924.

In Memorium

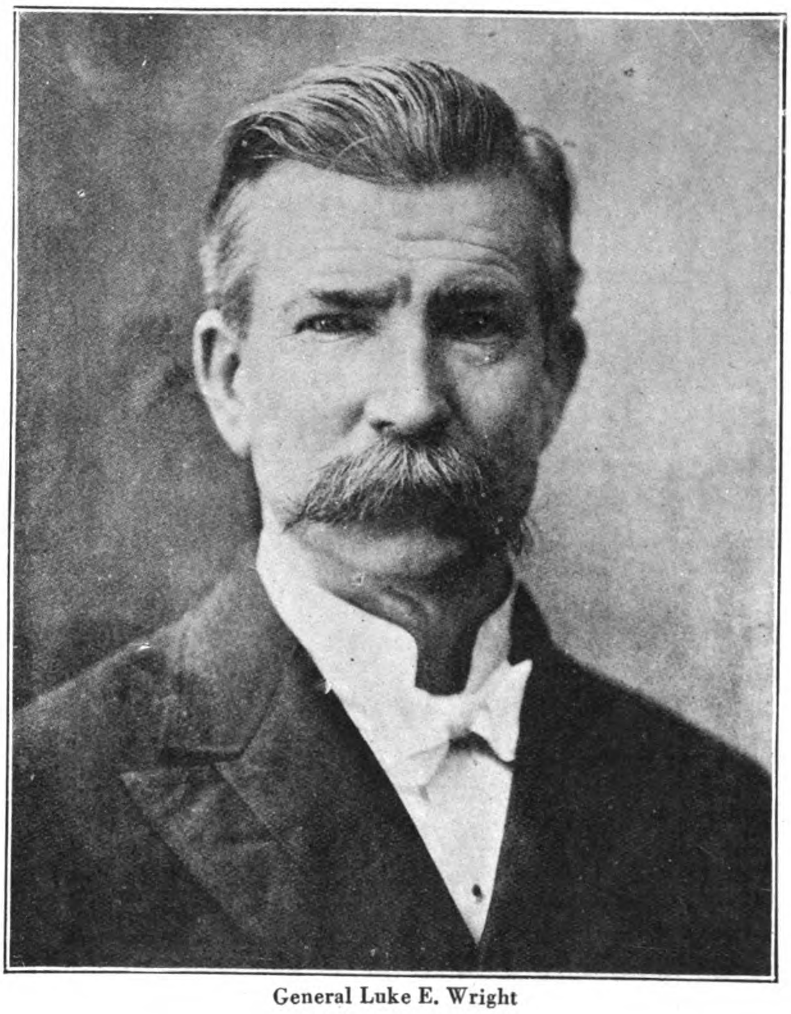
General Luke E. Wright

"The Father of THE FAR EASTERN REVIEW"

GENERAL Luke E. Wright, ex-secretary of war, former governor-general of the Philippines and first American ambassador to Japan, passed away at his home in Memphis on November 16, after an illness of several months. The name of Luke Wright will loom large in the annals of American penetration into the Orient. When the historian takes up his task, upon no pages will his pen dwell more extensively and approvingly than upon those recording the acts of the man, who stood at the helm of the insular administration during its difficult formative stage, the target for bitter attacks from those who endeavored to prolong the "Days of the Empire"; who subsequently carried to the court of the Mikado as our first ambassador the assurance of American goodwill, and afterwards filled the post of secretary of war in Roosevelt's cabinet where he continued to preside over the destinies of the islands and keep his finger on the trend of international developments in this part of the world.

General Wright gave a deep study to Philippine and Far Eastern problems, and on reaching a conclusion adhered to it during his stay in the islands. He felt that the archipelago was practically a virgen field, that the possibilities for development along commercial, industrial and agricultural lines were almost limitless. He was early convinced that the islands needed commercial, industrial and agricultural regeneration, and that a brilliant future awaited American trade in the Orient as a consequence of our occupation of the islands and the operation of the "open door" doctrine, recently proclaimed. In carrying out his basic ideas for the development of the islands and expansion of American trade and prestige in the Orient, THE FAR EASTERN REVIEW became a part of the program.

The liberal support tendered to this publication by the Philippine commission over which he presided made its growth possible and contributed largely to its success. THE FAR EASTERN REVIEW was founded in 1904 with the cordial support of the Philippine Government in order to give publicity to the material progress and commercial opportunities of the Philippines, to defend American aims, ideals and policies in the Orient and advance American trade in a field at that time dominated by a press, if not hostile, at least unsympathetic to our national aspirations. Much of its success is due to the initial whole-hearted support of Governor-General Wright and his successors, Ide, Smith and Forbes, over a period of years during which American firms in the Orient were conspicuous by their absence, and there were no commercial attachés, trade commissioners or chambers of commerce to carry the load of advancing national interests.


General Luke E. Wright

THE FAR EASTERN REVIEW has never willingly departed from the policies laid down by its original sponsors, whose sympathetic interest, guidance and confidence enabled it at all times to accurately interpret American ideals in the Orient and give a square deal to all other national interests in this complex and highly competitive field. THE FAR EASTERN REVIEW cheerfully acknowledges its debt to Luke Wright and his colleagues, and our most cherished compensation for the years of hard, uphill pioneering is the remembrance of his words of praise when last we met in Washington.

Space forbids the enumeration of the many excellent laws all tending to improve the material condition of things in the Philippines, drafted and put into force during his term of office. Always modest, self-effacing, generous, kindly and truth-loving, he will be remembered by those whose destinies were in his hands for many years and mourned by those who had the rare good fortune to work with him and be honored with his friendship. He represented the highest type of the fine, old, courteous southern gentleman; a type that is fast disappearing. The nation is the loser.

General View of Exterior

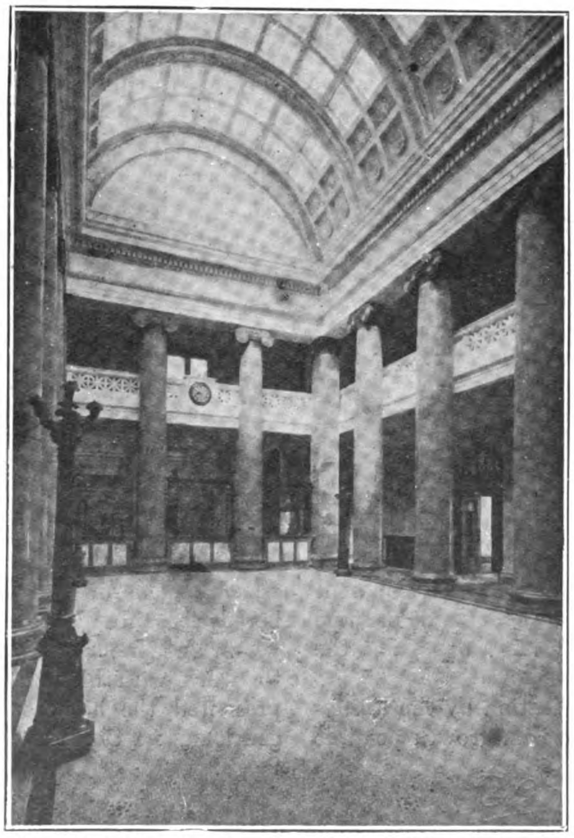
The New Kailan Building at Tientsin

THE new headquarters of the Kailan Mining Administration at Tientsin now nearing completion, is one of the finest examples of foreign architecture in China. It was designed by Mr. B. C. G. Burnett, the Tientsin representative of the well-known firm of Atkinson & Dallas, Ltd., in competition with several other architects. The contract for the erection has been carried out by Mr. Hong Mow-kee, a prominent Chinese builder of Shanghai, who has had special experience in the use of artificial stone such as is used for all the face work of the new structure.

The new offices form a rectangular pile 220 feet long and 120 feet deep with four stories aggregating some 70 feet in height, faced in artificial grey granite.

Mr. Burnett has adopted the Neo-classic style, and indicates Roman influence in the treatment of the main floor windows but, in the final plans, this has been eliminated by the adoption of square, mullioned openings, leaving the style throughout purely Grecian.

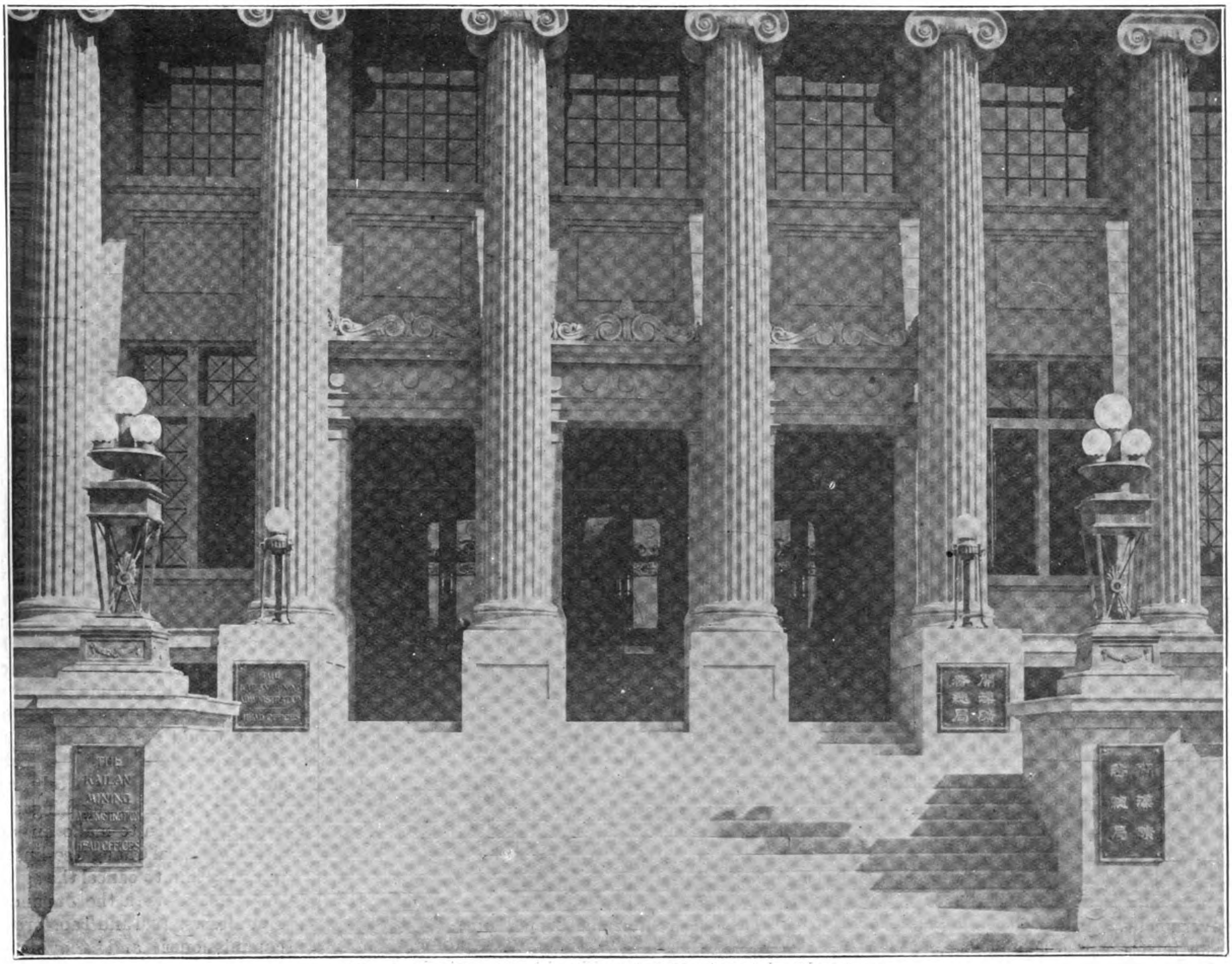
The main facades consist of colonnades Ionic columns on pedestals rising clear above the terrace, surmounted by an attic order. Boldly displayed on the main frieze is the administration's title and the year of construction in Roman numerals fashioned in bronze. The main entrance occupies the three central bays of the Meadows-road frontage and is approached by a broad easy flight of the steps in natural granite which lead to the vestibule through treble swing doors.



The Main Hall, looking towards the Cashier's Grille

All the floors and the very extensive flat roof are connected by two electrically-driven six-passenger elevators. The hot water heating is from a two-unit installation deriving its power from small boilers of the Lancashire type: the treatment of sewerage by the modern septic process; the expulsion of all waste water and sewerage by pressure through a metal pipe communicating with the river and the use of the most modern appliances for ventilation, signalling and electric lighting.

The total cost of the construction of the head offices is approximately half a million dollars, exclusive of the value of the land.



The Kailan Head Office at Tientsin: Main Entrance, Gates Open

Private Railways in Japan

PRIVATE railways operating in the country districts are becoming more and more important as feeders to the main lines of the imperial government railways. The government is to-day busily engaged in perfecting the trunk lines, and is willing to leave the building of the important lines tapping the agricultural, forests and mining centres of the interior to private enterprise, which in the long run, as they prove profitable to their initiators, will be nationalized.

Between 1911 and 1921 the length of private railway lines, excluding double tracking, increased 200 per cent. The capital invested in private railway comhanies in the same time increased from four to five times. Lines opened to business increased by 3½ times, and at the end of 1921 the mileage of private railways was equal to 30 per cent. of the total mileage of the national railways, the latter operating 6,728 miles, the former 2,138 miles.

Ten years ago the mileage of private railways was only 12 per cent. of that of the government railways, 605 miles against the government's 5,000 miles. The following table shows the details of the development of the private railways from 1911 to 1921 :—

	1911	*1921*
No. of railway companies	142	245
Mileage licensed	2,453 miles	4,519 miles
Lines open	605 ,,	2,138 ,,
Capital invested	Y.131,542,085	Y.632,422,255

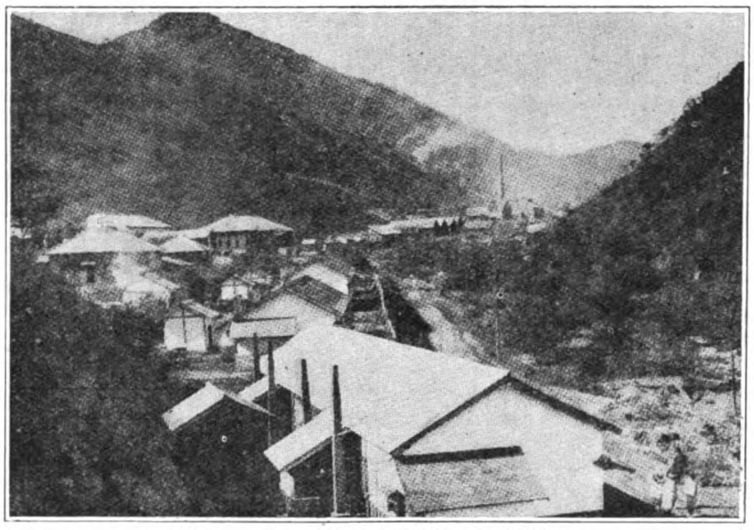
During the past ten years the quality of the equipment of the private, or light, railways has been remarkably improved. Ten years ago the railways and their equipment were distinctly primitive, and the standard of rails and carriages was very light. Costs of construction per mile averaged in 1911 only Y.5,400. to-day this cost has increased to an average of Y.140,000 per mile. Even allowing for the increased cost of all materials and labor, this great advance in the cost of construction per mile is almost entirely due to the great improvements which have been made in the equipment of the old lines, and in the higher standard of equipment adopted by each new line built. The light rails of ten years ago are practically all replaced with heavier makes, and as a result the tonnages carried by the private railways have been steadily increasing. Steam lines are to-day being gradually converted into electric power systems.

(*Continued on page 745*)

Tienposhan-Tumen Light Railway

THIS long talk of light railway connecting the Tienposhan Silver Mines with the Tumen river in the Chientao district of the province of Kirin, is being pushed to completion despite the protests of the Peking authorities who refuse to recognize the concession signed by the ministry of communications and the subsequent contract entered into whit Chang Tso-lin. Like every other enterprise in China it has encountered the stubborn opposition of the native gentry, who profess to see in it a surrender of sovereign rights to Japan and who have used every method of obstruction known to the Chinese to prevent work being started on it.

The Tienposhan Silver and Copper Mines are located in the Chientao district, ten miles southwest of Laotoukou and are operated under a concession held by the South Manchuria Development Company (Tahsing Company) a Sino-Japanese enterprise which has erected a refinery and smelter and made considerable progress in development work. In order to facilitate the transport of ore and metal to the coast, a light railway line, 80 miles in length, was projected that would connect the mines with the Tumen river. At the same time, such a line would also have an immense strategic value in the event of any attempt on the part of the reds to re-open the old issues with Japan in Manchuria, and could ultimately be made to form part of the proposed Kirin-Kwanei Railway for which Japan holds the concession from the Chinese government. Aside altogether from its economic significance, events are transpiring which justify Japan in her determination to push through the work and hold the Chinese to their signed agreements.



Tienposhan Silver and Copper Mine

The project for the construction of this line had its inception in 1915. According to the Chinese version of the intrigues surrounding the concession appearing in the *Peking Daily News*, a Japanese subject named "Fan-tien-yen-ta-lan" signed an agreement with a Chinese named Wen Lu for the formation of a Sino-Japanese company with a capital of Y.2,000,000. A set of regulations of 15 articles was fixed, and the sanction of the Chinese government obtained through the influence of Wen Lu. Investigation, however, indicated that Wen Lu was employed by the Japanese to use his name in dealing with the Chinese officials. The ministry of communications appointed delegates to inquire into the matter, and having satisfied itself with the fact that it was not a *bonâ-fide* Sino-Japanese concern, the permit was cancelled on the 23rd December, 1919. It was recognized that there was no necessity for the construction of the line, as it would run parallel with the Chi-Huei line, besides many other reasons. However, the Japanese did not stop work and last year began construction on a large scale. The Chinese again raised objections, as there was no Chinese share in the Company, and the ministry of communications again appointed delegates to investigate. It was discovered that there was not a single Chinese share in the company, and that, moreover, the mines at Tienpaoshan had stopped operations for a period of more than one year.

Fearing that the result of the above-mentioned investigation would cause them to stop construction work, the Japanese employed a certain Hsu To-yu, secretary of the Company, who styled himself representative of the Chinese shareholders, to proceed with large funds to Holunghsien and Yenchibsien to enlist the assistance of the gentry there, who have ever since been styled as Chinese shareholders and who will be entitled to a certain amount of dividends without paying a single cent for their shares. Last April the Japanese began again to construct the line, and the students and merchants at Yenchi and Holung made a demonstration during which the Chinese shareholders were severely beaten. The Japanese published false reports stating that the movement against the construction of railway was engineered by Chinese connected with the independent party of Korea. Consequently the Japanese consul demanded the extradition of these two gentlemen, who went to Peking to obtain protection and redress. In July when President Li Yuan-hung was reinstated and parliament restored, Messrs. Li and Wen began to show the cabinet, parliament, the ministry, etc., the aggression of Japanese in their native district; and the government telegraphed to Mr. Tao, taoyin of Yenchi, instructing him to come to Peking to discuss the matter. At the same time General Chang Tso-lin, who was informed of the trouble, ordered Mr. Tao not to proceed to Peking but to come to him at once. The people, knowing that there would be no good result if any decision should be made in Mukden, immediately appointed Messrs. Chang Ping and Huo Wan-chen to make an appeal to General Chang Tso-lin, requesting him to cancel the agreement made with the Japanese. But Messrs. Tsai and Tao, foreign commissioner and taoyin of Yenchi, respectively, were there before them, and were secretly instructed by General Chang Tso-lin to support the Japanese. The representatives of Yenchi and Holung were received in audience by Mr. Wang Yung-chiang, who advised them to return to Kirin where they might appeal to their own officials, as Fengtien authorities did not like to interfere with the affairs of Kirin. They at once sought an interview with their commissioner and taoyin, who informed them that General Chang had already had an agreement with the Japanese, and that probably after the cancellation of the agreement, a Japanese loan would be contracted for the Chinese themselves to construct the line. The representatives lodged a written protest with these two officials, who showed the document to General Chang, but General Chang said that he did not like to handle the business and ordered that the representatives should return to Kirin to arrange with the authorities there. They at once returned and approached Mr. Kuei, the shenchang, who told them that being a native of the province, he would not conclude any agreement with Japan. At this time Messrs. Tsai and Tao paid another visit to Fengtien, where a secret agreement was signed between them and the Japanese. The agreement consists of 14 articles and stipulates that a loan of Yen 4,000,000 should be concluded for the enterprise. The publication of the news at once aroused the indignation of the people of Yenchi and Holung, but General Chang Tso-lin threatened to resort to drastic measures should the people raise any objection against his action. Again the people sent their representatives Messrs. Chang and Huo to the capital where they interviewed various important officials on the 13th and 14th October. Both the ministries of foreign affairs and communications have started to institute investigations, and the former will

lodge a strong protest with the Japanese legation after a report is received from Kirin. The Japanese legation will be informed that any agreement signed between Japan and Mukden without approval of the central government will be considered null and void.

Notwithstanding the protests of the waichiaopu, the Japanese m nister has refused to consider it, or even to transmit the protest to Tokyo, basing his action on the statement that the contract was legally signed and ratified by a former minister of communications at Peking, and more recently ratified by the tuchun of Manchuria, Chang Tso-lin.

The formal agreement was signed by the Japanese company and the Chinese authorities notwithstanding the opposition of the ministry of communications in Peking. Furthermore, the Kirin provincial assembly declared that without its concurrence as the representative of the Kirin people, the agreement will be considered null and void; but General Chang Tso-lin says that by election of the provincial assemblies of Fengtien, Kirin and Heilungkiang, in his capacity as chief commander of the Paoan army or peace guards of Manchuria, he recognizes neither the veto of the Peking government nor the minority of opposition in the Kirin assembly, so that constructional works will begin by the concessionaire in accordance with the stipulations of the Sino-Japanese agreement which has been endorsed by the Japanese consulate-general in Mukden.

Such are some of the difficulties surrounding the most commonplace business for the development of China at the present tim3, b1t wiich, aft3r all, are true to traditions and precedents.

Private Railways in Japan (*Continued from page* 743)

During the war many railway companies were unable to raise funds to build lines which had been licensed, and their licenses lapsed, but after the war there was a boom in railway building, and the boom still continues.

Tramways, urban railway lines, have also been increasingly prosperous, and since 1913 (Figures previous to 1913 are not obtainable), there has been a remarkable growth in the costs of construction per mile opened to business, although the mileage in operation has not shown a corresponding increase. The following table shows the development of tramways since 1913 :—

	1913	*1921*
No. of companies and official corporations operating tramways	124	189
Licensed mileage	1,625 miles	2,245 miles
Mileage opened to business ..	1,139 „	1,332 „
Costs of construction	Y.258,231,940	Y.933,683,450

Construction, as in the case of priva te railways, slacked off during the war. To-day, however, tramways are being constructed in all the principal centres of business, and the large cities are extending and improving their lines, the development of all the urban centres calling for large investments in better transportation facilities. Many of the cities where the tram lines are not owned by the municipality are planning the municipalization of the private lines. The city of Nagoya has just purchased the private tram lines in that growing city. To cover the purchase price a bond issue will shortly be floated. Such municipalizations are, however, difficult of realization under present financial conditions. The national government too does not countenance the issue of bonds for sale abroad. Consequently the advancement of the urban transportation facilities where capital must come through foreign investment is badly handicapped in Japan to-day.

The number of local (private) railways which received the governmental subsidy during 1921 fiscal year amounted to 51; the amount of subsidy reached Y.914,066 which was an increase of Y.293,552 as compared with the previous year. The following table gives the names of the railways, their mileage of operating lines, and the amount of subsidy :—

Names	Mileage	Amount (in Yen)
Malesuzaka Ry Co. ..	14.4	Y.1,909
Uonuma	8.1	3,355
Tateyama	13.0	6.933
Shonan	5.5	780
Yoro	35.8	65,218
Chuen	6.3	5,415
Miyazaki	12.5	14,474
Chugasa (Nakagasa ?) ..	15.7	246
Miyazaki Kenei	3.9	9,828
Odawara Denki	5.6	127,706
Ujima	10.6	19,438
Ichihata Keiben	13.0	3,781
Yokkaichi	10.2	1,019
Uwajima	11.1	598
Takeoka	6.0	593
Chiba Kenei	14.1	59
Ise	16.9	37.131
Anno (Yasuno?)	12.2	13,344
Akami	3.6	3,533
Onsen Denki	6.6	17,367
Nagaoka	18.8	6,877
Sutsu	1.2	46,157
Ako	7.9	13,537
Hideu	8.8	9,439
Akita	18.2	48,399
Nagareyama Keiben ..	3.5	4,493
Shinoyama Keiben ..	3.0	4,716
Onoda Keiben	2.9	33
Awa Denki	8.7	31,136
Mihata Keiben	4.0	4,820
Arita	5.7	13,136
Osumi	15.2	4,998
Anan	6.5	7,290
Funaki	3.7	4,645
Santo Keiben	6.1	2,106
Kusatsu Keiben	22.9	34,229
Joshu	6.5	6,134
Mie..	3.7	9,546
Azumano	8.2	1,568
Ehime	16.1	78,158
Tsukuba	24.9	25,793
Yamato	6.3	10,825
Jozankei	18.6	9.315
Maruko	4.0	4,584
Nagato	11.3	3,634
Ohso	12.9	24,329
Kaetsu	4.1	15,661
Tama	4.4	26,233
Hizen Denki	6.0	26,538
Boseki	11.6	81,036
Saseho Keiben	9.0	21,571

Flour Industry in Manchuria

The flour industry in Manchuria has not been prosperous for some time, but owing to a good harvest of wheat, mill owners are very optimistic this year. There are now 46 flour mills in Manchuria with a daily capacity of about 60,000 bags (15,000 barrels). The following table shows the number of mills in the different parts of Manchuria and their respective daily output :—

	Number of Mills	*Daily Capacity*
Harbin	23	33,150 bags
Districts along the Chinese Eastern Railway ..	5	2,150 „
North Manchuria	6	3,600 „
Manchuria, South of Changchun	12	23,800 „
Total	46	62,700 bags

American Enterprise in China

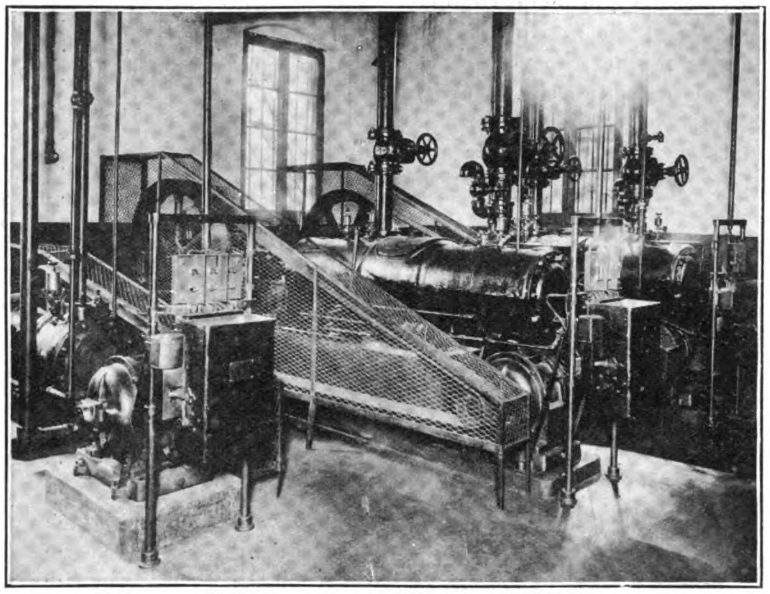
Lamp Factory of the China General Edison Company at Shanghai

AMONG the industrial achievements in Shanghai, one of the best known, is the lamp factory of the China General Edison Company.

The visitor's car brings him out from the busy business section of Shanghai, through the residential section of the international settlement out into an old-time Chinese village. One's car crowds through the jostling wheel-barrows and ricshas, skirts a dirty creek crowded full of beggars boat houses, with their arched bamboo roofs, and passes a solid block of straw thatched huts. Just beyond these straw primative hovels of the villagers, the car comes suddenly to a large open field, on the left side of which stands the red brick lamp factory, and on the right rises the stack of the glass factory. The American flag waves over the field in a way expressing the contrast between the old and the efficient business policy of America, guaranteeing quality and fairness.

From a start five years ago this factory has grown until now the well-known G. E. lamps are produced in a factory, equipped with modern American machinery, capable of producing efficiently from four to five million lamps a year. And yet to an engineer visiting this factory, the impression is that this growth has only just begun.

In the sales office the visitor from America finds the Chinese clerks handling the same efficient system of handling orders as used in the home office of the International General Electric Company, except in so far as these methods have been modified by long experience to meet special conditions in China. American executives are in charge of this work.

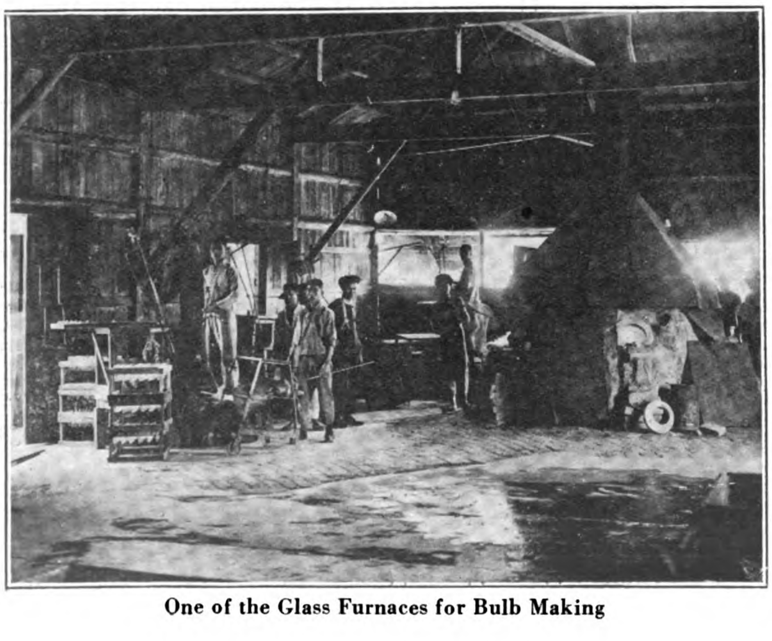


Electrically Driven Vacuum Pumps and Compressor

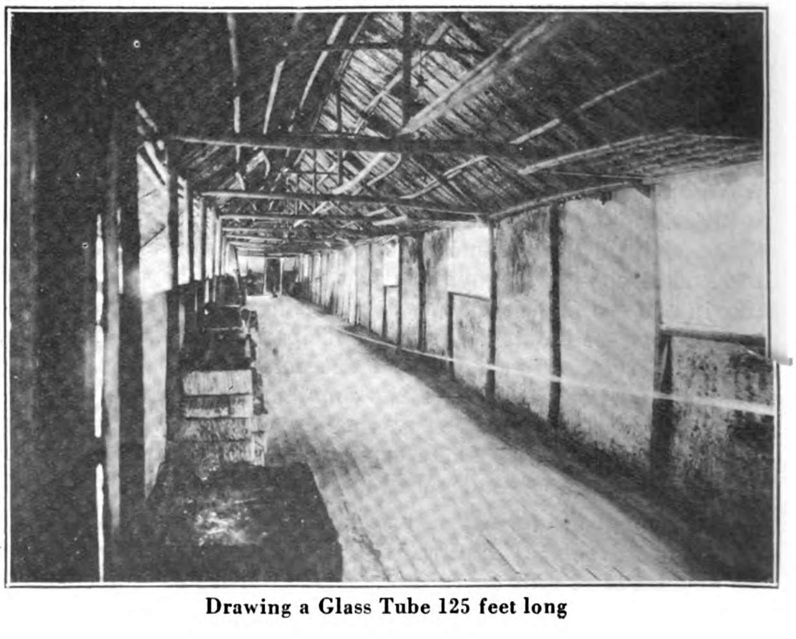
The success of the sales office, however, has been due to the quality of goods turned out by the factory. The visitor passes on quickly to the factory itself. The American manager of this factory has two convictions, to prove which he came out to China. First, that the Chinese are able to turn out a product equal to any; and second, given proper supervision and good working conditions, Chinese labor can do this work efficiently.

One chart over the manager's desk proves the first point, superior quality in the lamps—for this curve of lamp sales, showed that there was no drop in the lamp business for 1921, in contrast to the almost universal sharp decline in business in almost every other line, due to financial conditions and competition. The G. E. Edison lamps have built up the reputation of good appearance, high efficiency and long life.

Other curves hang there in the manager's office, tell the story of factory management. Those black lines on the ruled paper, picture exactly from week to week, just what the factory organization is doing. Here is one showing the total lamp production per operator per hour. Another carries the individual or average production of each process of manufacture, such as filament winding, bulb exhausting, basing, testing, until the lamp is packed ready for shipment. If the curve goes up, showing a loss, or drop in speed, careful investigation follows. In fact, unless the curve goes steadily down and down, showing increased speed and less loss, personal investigation follows. Under modern supervision the efficiency of the Chinese operators has been increased 50 per cent.

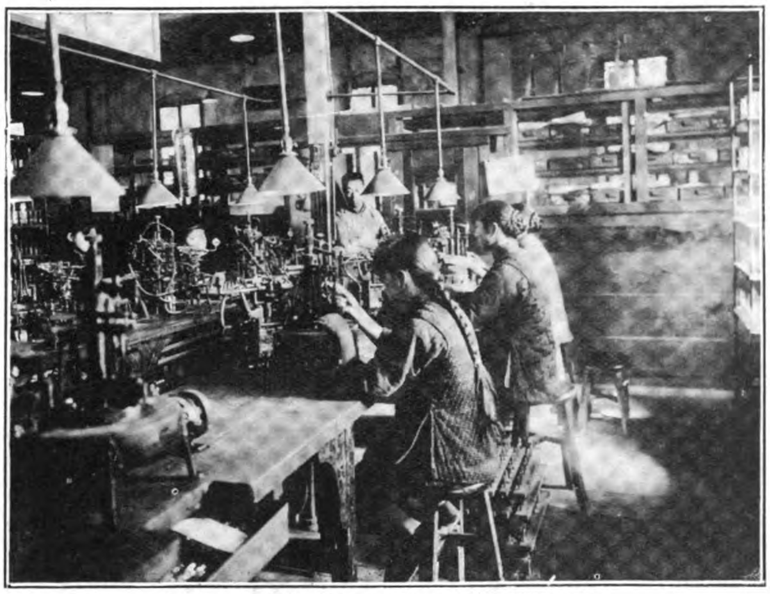


One of the Glass Furnaces for Bulb Making



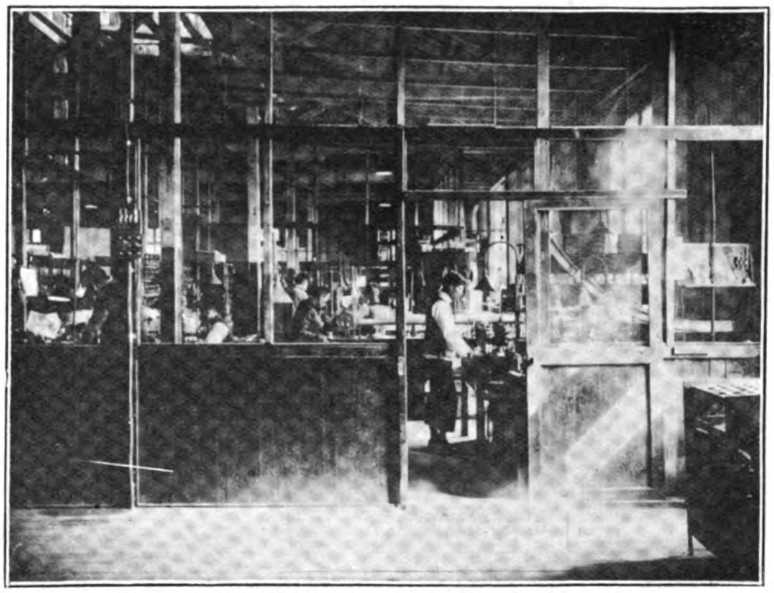
Drawing a Glass Tube 125 feet long

Filament Winding Tables



Anchoring Machines, supports for Filaments

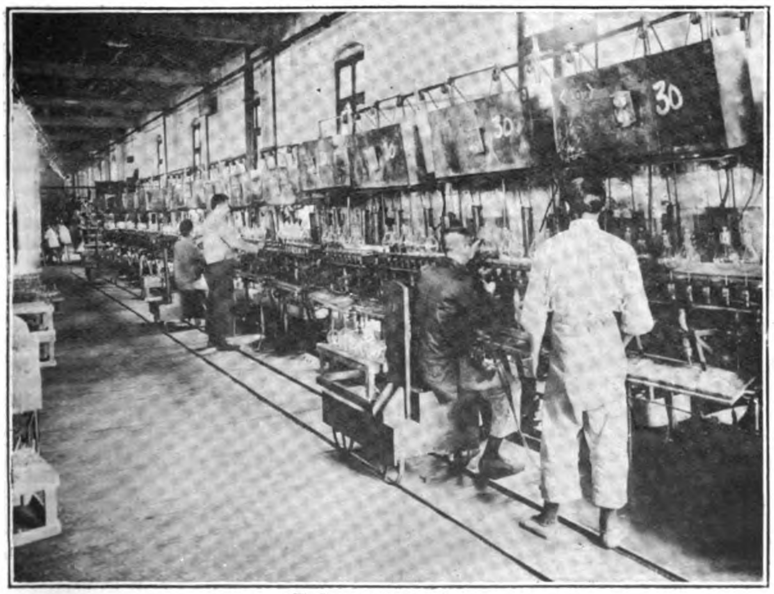
High across these curves, there is drawn a bright red line, showing the best record that has been made by American lamp works in each particular process. Any individual operator or group of operators who make their records meet this red line, are given a bonus. Those black curves touch the red line more and more often as the weeks pass, showing that the manager's belief is being justified and that Chinese labor under proper supervision cannot only do good work, but do it efficiently.



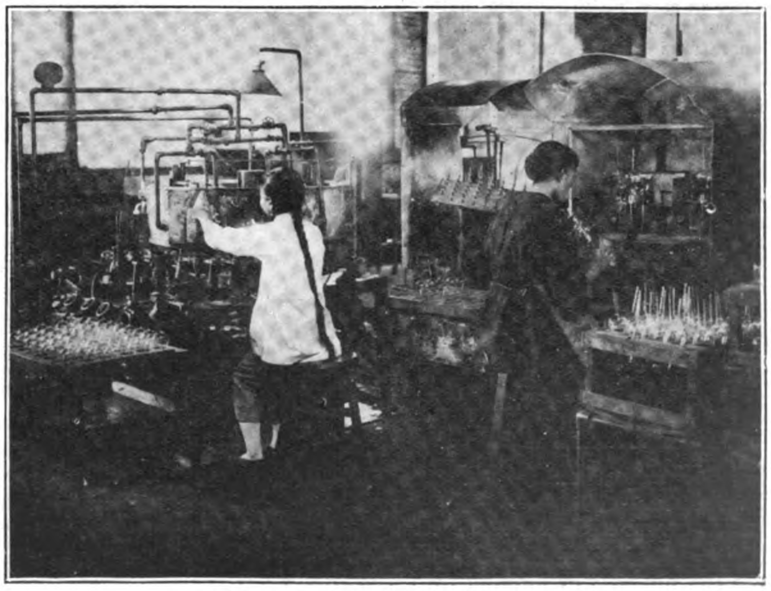
Preparing and Coating Tungsten Wire for Mounting

Out in the factory, this management takes on personal terms. The man in entire charge of production is an American. Under him are two Chinese engineers, who have been thoroughly trained through technical schools in America, and five years of practical experience in lamp manufacturing in the States. The remaining foremen have each been personally trained for their particular work. Of the three hundred and seven employees under these trained engineers, ninety-nine have been with the company for two years or more. Under careful supervision the employees have learned to do their work well. In the large factory room, the neat dress and the fast quiet work of the Chinese women operators at once catches the attention. The comfortable loose waist and neat pants of the Chinese women form the most ideal cloths for work. The slender flexible Chinese hand is peculiarly fitted for the manipulation of delicate parts of lamp construction. Right by the door, as the visitor goes in is the testing rack—a constantly moving circle of lamps, constantly replenished by the operator, with lamps to be

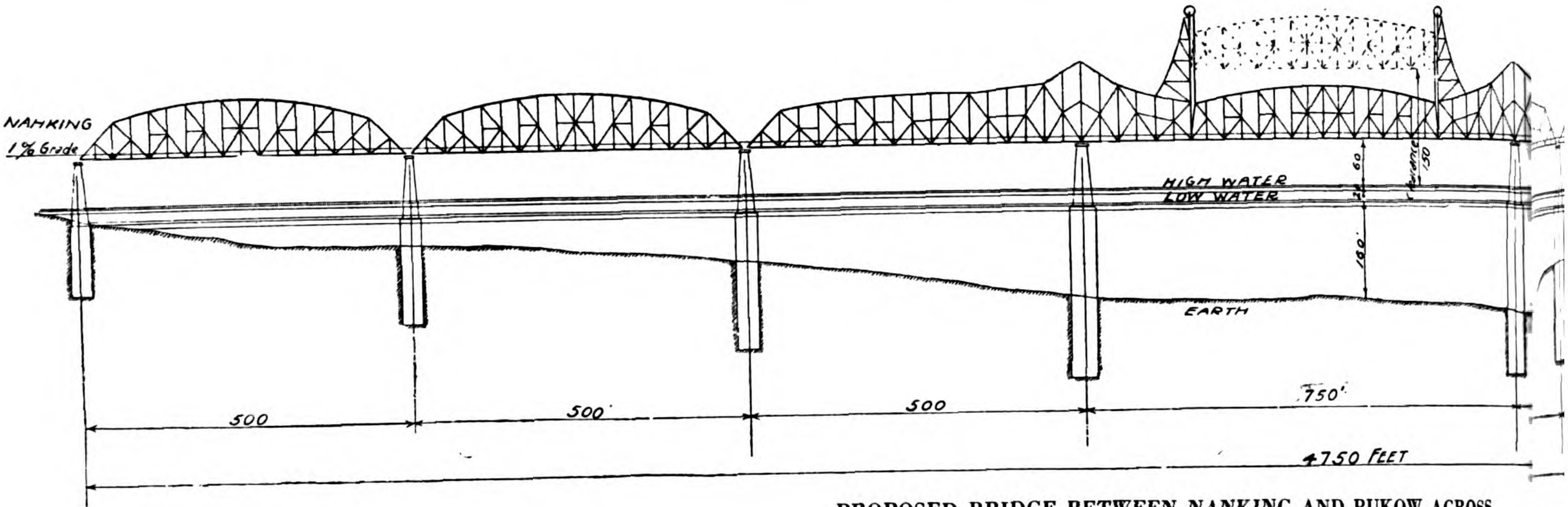
(*Continued on page 756*)



Exhaust Machines



Exhaust and Sealing in Machines



PROPOSED BRIDGE BETWEEN NANKING AND PUKOW ACROSS

Report Upon a Project for Bridging the Yangtze River Between Cities of Nanking and Pukow

By Dr. J. A. L. Waddell, Consulting Engineer

[This is the second of the bridge designs prepared by Dr. Waddell for the ministry of communications and given by them to the Journal of the Association of Chinese and American Engineers for publication. The material is self-explanatory. It may be interesting to note that Dr. Waddell did not consider a bridge across the Yangtze at Nanking justifiable in view of the traffic. The river bottom at this section is extremely uncertain and consists of a soft silt to an unknown depth. The harbormaster instructs all ships anchoring there to lift their anchor at least once every 36 hours. Anchors left in longer than this time usually become imbedded and cannot be pulled out.

The type of foundation recommended by Dr. Waddell is similar to that prepared for him for the bridge across the Mississippi River at New Orleans, for which he was the consultng engineer. The erection of the bridge at New Orleans has been postponed due to the high price of steel resulting immediately after the conclusion of the war, but operations are expected to be resumed some time in the near future. The Mississippi at New Orleans also has an unknown scour and a varying silt bottom.]

Peking, October 28th, 1921.

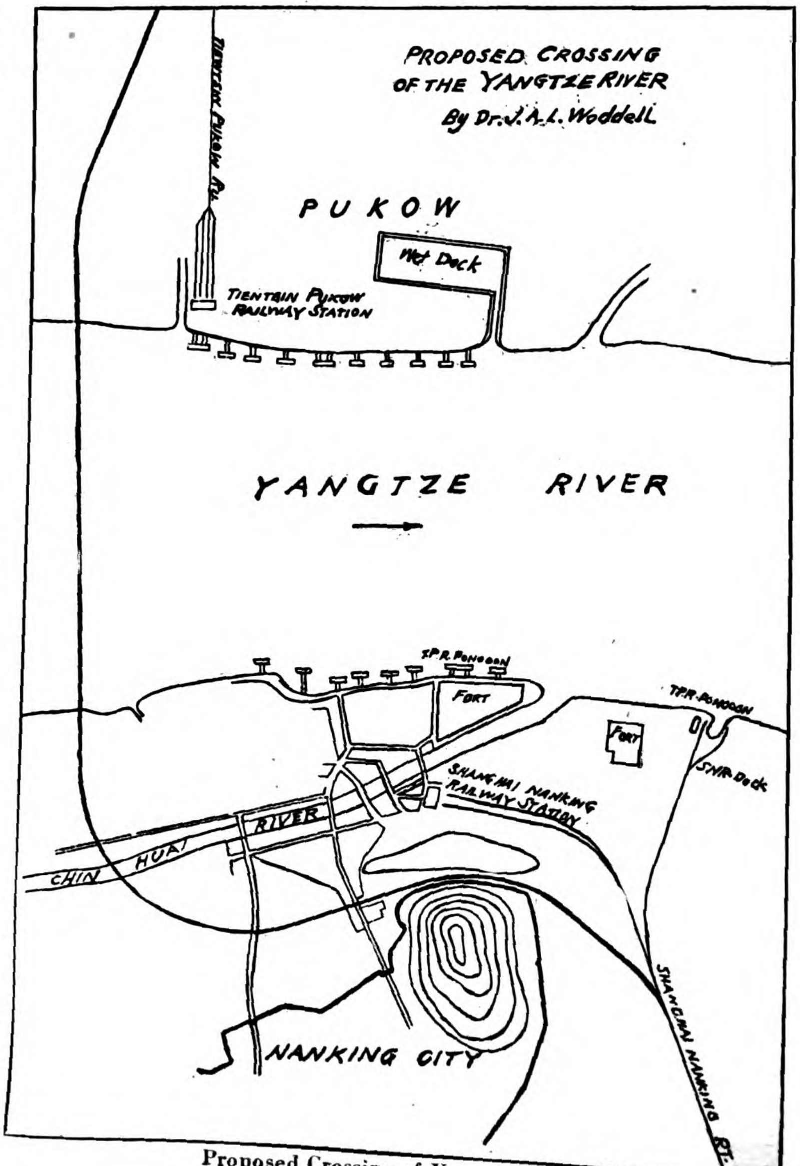
To His Excellency,

The Minister of Communications,

PEKING.

Your Excellency,

After completing my investigations at the mouth of the Han River in relation to the proposed bridging near there of that stream and the Yangtze-Kiang. I proceeded to Pukow for the purpose of looking into the possibility and expediency of building a bridge across the latter river between the cities of Pukow and Nanking; and now beg to report as follows:



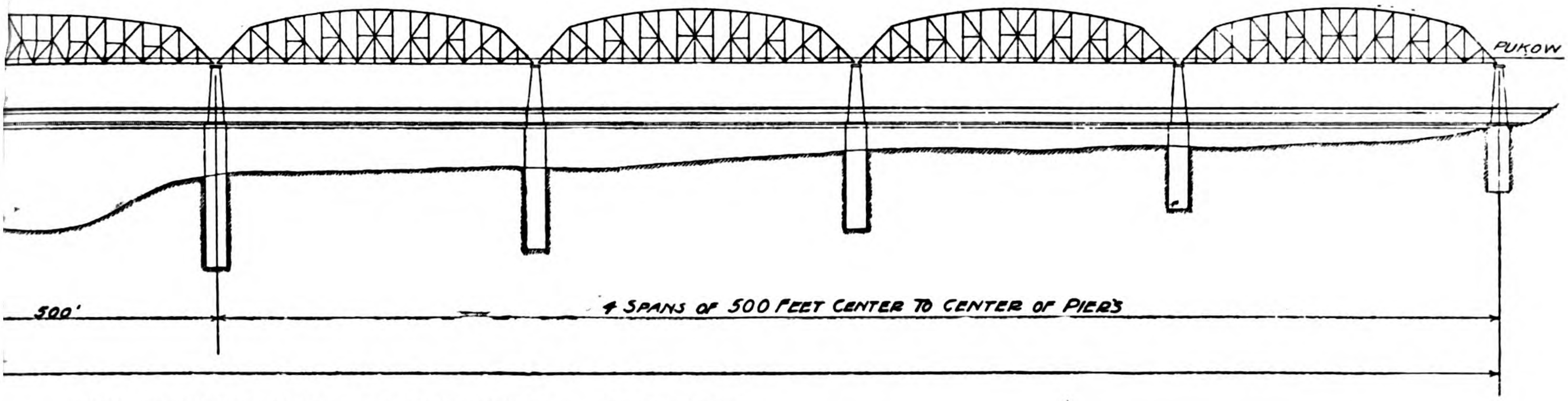
Proposed Crossing of Yangtze River

FEASIBILITY.

The conditions for building a birdge at this location are difficult, for the caissons of the piers would have to be put down far deeper than those of any other bridge yet built, because, as well as I can determine, there is no bed-rock within reach, and the depth of water at lowest stage is over 160 feet. This does not mean that it is impossible to build the proposed structure, but only that it would be expensive, especially as contractors are timid about attempting to accomplish the unprecedented. However, I should not hesitate an instant about undertaking to design and engineer the building of such a bridge, were I called upon to do so. I have already advocated the construction of a great bridge across the Mississippi River at New Orleans, where the conditions are unprecedented and quite similar to those here under consideration. However, in this case it might prove necessary to found the caissons somewhat deeper below low water than those for the proposed New Orleans strcuture.

EXPEDIENCY.

In respect to the question of expediency, I am compelled to report adversely to the pro-



THE YANGTZE RIVER. DESIGNED BY DR. J. A. L. WADDELL

ject; because there is no traffic of any kind between the two cities which would begin to warrant the construction of such an expensive structure as the proposed bridge would have to be. Nor do I believe that, even in the next fifty years, there will be any business large enough to require its being built. Only a single line of railway now enters Nanking; and that line parallels the river from Shanghai. As steamers can always carry freight more cheaply than railroads, all freight from Shanghai destined north will naturally go by water to Pukow, and will not need to be carried across the river. Thus only the passenger traffic of a single railway would use the bridge; and at present there is not enough of it, in my opinion, to warrant the building of a carferry—much less a bridge. The little passenger traffic bound northward, and that of the reverse journey towards Shanghai, can readily be taken care of for many years to come by two fair-sized ferry boats of the ordinary type.

Although I am opposed for economic reasons to the construction of the bridge, as the problem of how to build it and to determine the approximate cost thereof has been set me, I shall proceed to its solution.

Sources of Information.

I obtained the necessary information for the making of cost estimates from several reliable maps and charts, and by asking questions of certain persons residing in Nanking, also by a personal reconnaissance of the route for a railway connection between the roads on the two sides of the river. On Sheet No : 1 of the accompanying drawings is shown the line of route, from the railway to the south to and across the river and then towards a connection with the railway on the north. The route was easily determined, as there was but little choice of crossings. The cities are situated opposite each other on the two sides of the river and at its narrowest point in the vicinity. The bridge tangent was located up-stream from the right line joining the ciries centres for two reasons :

First. It gives a satisfactory means of connecting the two railway systems without material injury to property, and

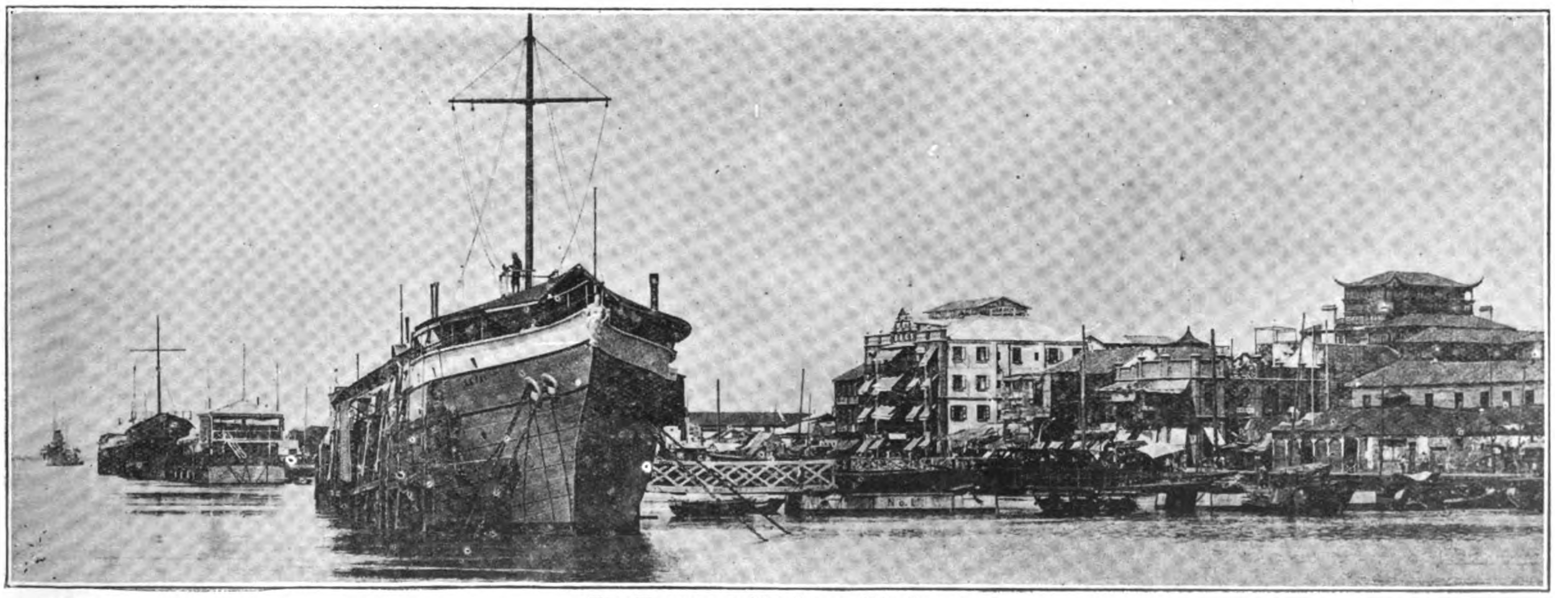
Second. It avoids the necessity for opening the lift-span to accommodate the passage of vessels not destined for up-river points beyond Nanking.

River Conditions.

As these are of a similar character to those at Hankow, although there are not as many junks passing, I have assumed, as before, a minimum clearance of 150 feet above extreme high water for ocean-going vessels under the vertical-lift span and one of 60 feet above the same everywhere else for junks. The difference in height between extreme high water and extreme low water is only 24 feet. or less than half of that at Hankow.

Layout.

Starting from the south bank, the structure, consists of two simple-truss spans of 500 feet each, then an anchor arm of 500 feet, then a cantilever span of 750 feet, then another anchor arm of 500 feet, and finally four simple-truss spans of 500 feet each, all distances being measured from centre to center of piers. These



The Yangtze at Hsiakuan (Nanking)

nine spans will cover practically the entire river between highwater shore-lines.

The greatest depth assumed for caisson foundations is 250 feet below low water at the deepest part of the section ; and from there to the banks it gradually reduces to 100 feet. It is possible, of course, that these depths are not great enough to reach sufficiently-solid material to afford proper bearing-resistance, but this point cannot be settled without the making of expensive borings. The assumption, however, is sufficiently accurate for the preparation of a preliminary estimate of cost.

TRAFFIC PROVISIONS.

As the cities of Nanking and Pukow are not of great commercial importance, and as their populations are comparatively small, there is no need to provide on the bridge for highway or pedestrian travel. In future it would be practicable to build approaches to the structure for an electric-railway system and to carry its tracks by gauntleting over the space occupied by the steam railway.

Owing to the great width of river and to the possible future importance of the proposed bridge, a double-track-railway structure has been adopted. It would not be good engineering to consider the building of a single-track structure for such a crossing.

GRADES.

The limiting grade on the approaches I have taken as one per cent., properly compensated, of course, for curvature.

LIVE LOAD.

As in the case of the proposed Hankow crossing, the railway live load selected is Class 60.

METHODS OF CONSTRUCTION.

Owing to the great depths of both the water and the caisson foundations, the sinking will have to be done by the open-dredging process, and the shells of the caissons will have to be built of timber. The piers are to be constructed as described in my previous report upon the proposed Hankow crossing and the spans are to be floated to position.

MATERIALS.

In respect to the unit prices of materials and the quantities thereof, see the just-mentioned report.

Estimate of Total Cost

SUPERSTRUCTURE.

Ordinary carbon steel	63,000,000-lbs. @ 11 cents	$ 6,930,000
Machinery and Ropes	680,000-lbs. @ 50 cents	340,000
Floor	4,750 lin. ft. @ $30	143,000
Counterweights ..	900 cu. yds. @ $25	23,000
Electric machinery and house	.. ..	54,000
Total Cost of Superstructure	.. .. ..	$ 7,490,000

SUBSTRUCTURE.

Main Piers, 4 @	$1,100,000 (Average)	$ 4,400,000
End Piers, 2 @	280,000 (Average)	560,000
Other Piers, 4 @	530,000 (Average)	2,120,000
Total Cost of Substructure	.. .. ..	$,080,0000

TOTAL COST OF STRUCTURE.

Superstructure	$ 7,490,000
Substructure	7,080,000
Approaches	3,150,000
Summation	17,720,000
Engineering and Contingencies, 10%	1,772,000
Grand Total Cost of Structure	$19,492,000
Say $19,500,000	

ECONOMICS.

The close equality in total costs of substructure and superstructure indicates that my layout is not far from economic. The diagram on page 164 of "Economics of Bridgework" shows that the economic span-length for foundations of this assumed depth for double-track railway bridges is 430 feet ; and the diagram on the previous page evidences that a variation of 50 feet above or below this figure would make very little difference in total cost of structure. This would make the range for such depth from 380 to 480 feet, while I have adopted 500 feet. I think that, for the assumed conditions at the proposed crossing, the larger figure is more nearly correct than the record of the diagram, owing to the high price of substructure timber and the difficulties that would be encountered in putting the caissons into proper position.

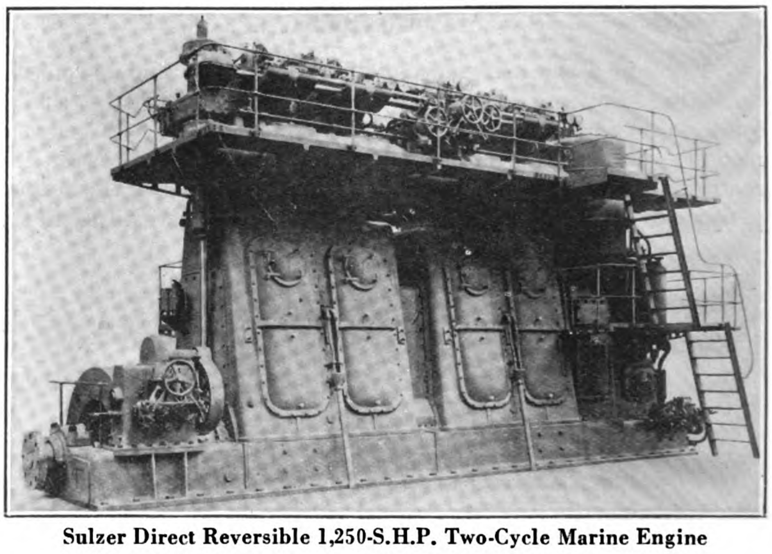
CONCLUSION.

Owing to lack of reliable data concerning substructure conditions, the preceding estimate is not as accurate as the one I made you for the proposed bridges over the Yangtze and the Han Rivers at Hankow ; but it is close enough to correctness for all practical purposes, especially in view of the fact that I am advising against the construction of the bridge.

The Largest Diesel Engined Vessel

A New Success of the Sulzer 2-Cycle Engine

THE Union Steamship Co. of New Zealand has placed an order with the Fairfield Shipbuilding Co., Ltd. in Glasgow for a motor passenger liner of 22,000 tons, which will be equipped with machinery of the Sulzer 2-cycle type of 12,000-13,000 BHP. Beside the main engines there will be auxiliary engines of about 1,500 BHP., the total engine power amounting to about 14,000 BHP. This ship will not only exc'te general interest because it is the largest passenger motor liner, driven by Diesel engines, but specially in view of the machinery, which in size and power by far exceeds anything that has been done up to now in connection with motor ships. The Fairfield Shipbuilding Co. is a licensee of Sulzer Brothers in Winterthur. This new order seems to prove the fact, that for large powers the 2-cycle engine is decidedly more advantageous than the 4-cycle and as the general tendency is towards the building of big ships an important field is opened for the 2-cycle system of Diesel engines.



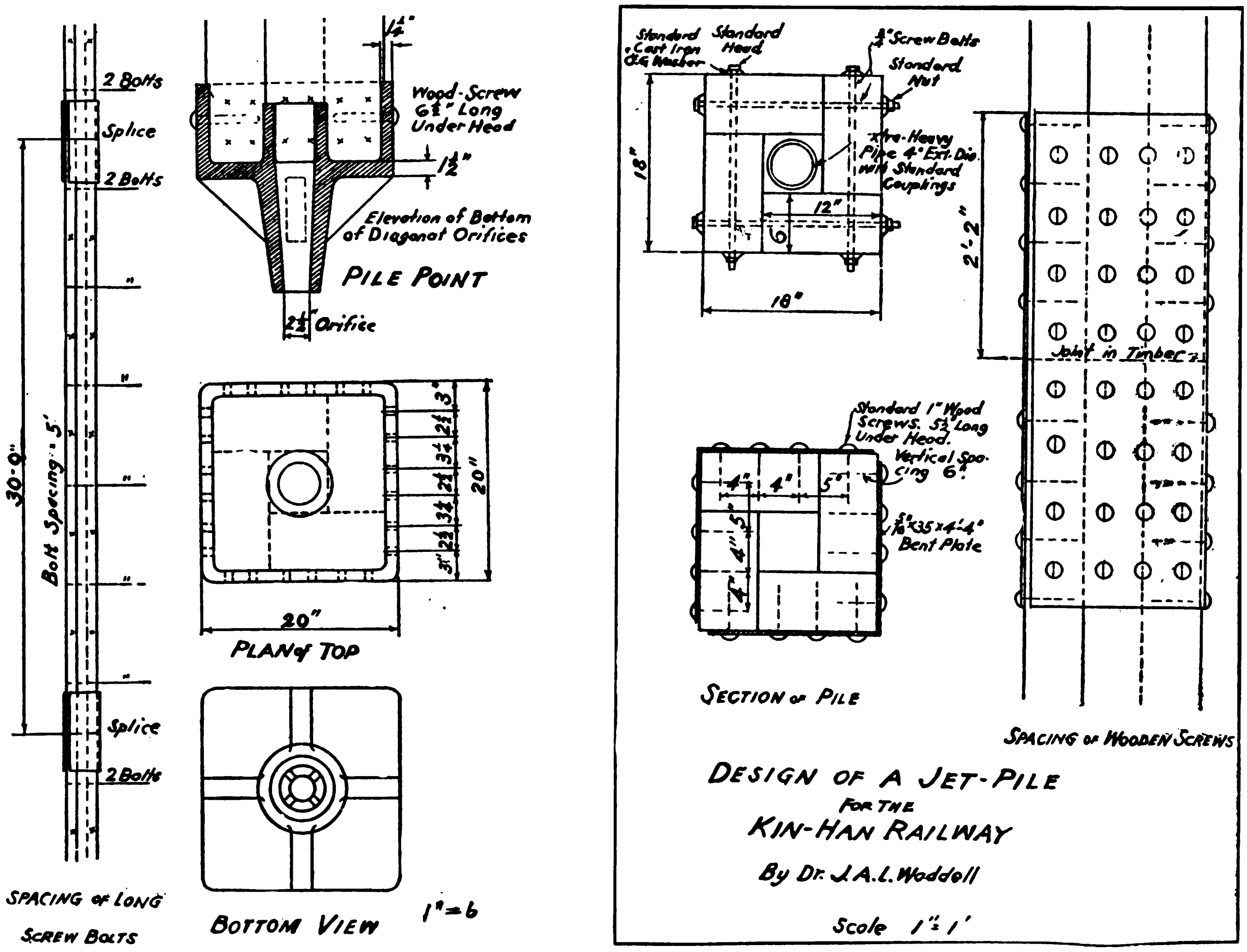
Sulzer Direct Reversible 1,250-S.H.P. Two-Cycle Marine Engine

It may be mentioned as a curiosity that this special development of motorship equipment has been started by a firm in Switzerland, a country completely cut off from the sea.

A Hydraulic Pile for Use on the Yellow River Bridge and for Other Foundations in China

Recommended by Dr. J. A. L. Waddell to the Ministry of Communications

The large saving made by Dr. Waddell on his different bridge designs for the Yellow River and Yangtze crossings were in great part made possible by the type of foundation chosen by him. This included the use of the hydraulic pile as described below. Dr. Waddell believed that the most economic type of foundation for the majority of the Chinese railroad bridges, particularly those in the alluvial plain regions, was the pile caisson type, that is, a caisson sunk to ten or fifteen feet below the river bottom and resting upon concrete imbedded piles.—*Journal of the Association of Chinese and American Engineers.*



ABOVE is a drawing of the hydraulic pile which I evolved to meet the conditions at the Yellow River crossing, and at similar crossings in China. All the details are shown excepting the block to interpose between the top of the pile and the hammer. This I can describe and thus save the labor of draughting.

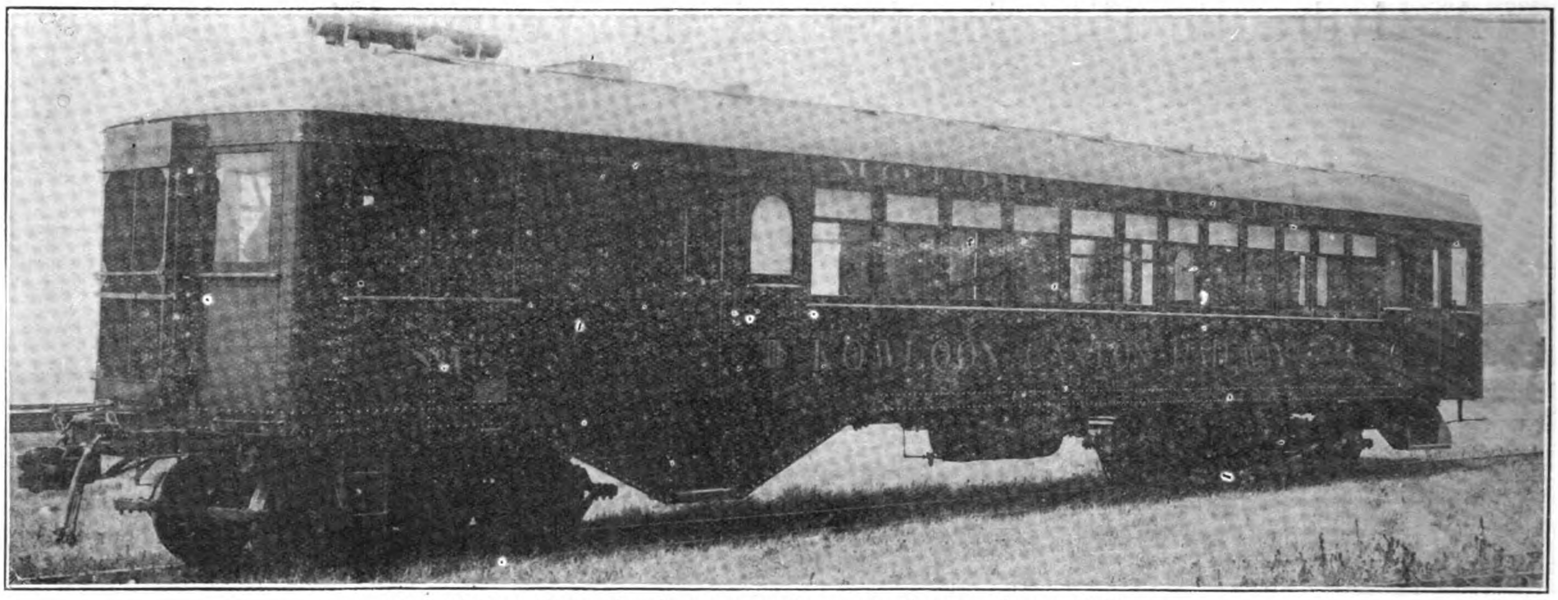
It can be made of either timber or metal, and there must be a hole at one side large enough readily to permit the passage of the goose-neck. When this goose-neck is to be removed, the hammer is raised, and then the block is raised also. After this, the goose-neck is unscrewed and another length of pipe attached.

There are two ways in which this pile can be used, depending upon the condition of the soil. If the latter be such that you can drive down a pile say 50 or 60 feet by the water-jet, then take off the jet, extend the pipe, extend the pile, put on the jet again, and proceed, your work would be much simplified, for then you would not have to pick up and handle very long piles and submit them to great bending moments. In this case, you can use timber scabs for the splicing of the abutting ends of the pile sections, and thus save the expensive metal that I have laid out for splicing.

The second case is when the material is such that if you were to try the method just described, you would be unable to start the jet to working again after lengthening the pile. In that case, the pile must be built full length at the out-set, and the pile driver must be high enough to take care of it. Under these conditions it will probably be necessary to use the steel plates for splicing, because the scabs would not be strong enough to resist the bending due to the weight of the long pile, if it were picked up near the middle to swing it into place.

The following is a description of the pile. It is to be built of 6-in. by 12-in. timbers thirty feet long, more or less, but all of the same exact length, in a square section of 18-in. with a 6-in. square hole in the interior. All joints are to be square cut. At the lower end of the pile there is a casting of either steel or iron, preferably of the latter, if made in China, as it should be. Probably a cast-iron point would weigh quite a little more than a cast-steel one. The design that I have made will be amply strong for all conditions to be met with, including beds of fairly large boulders. You might find later on that you can trim down the thickness of the metal considerably, and thus economize on the cost. If you know for certain that

(*Continued on page 753*)



The Hall-Scott Motor Coaches in operation on the Kowloon-Canton Railway

Motor Coaches on the Kowloon-Canton Railway

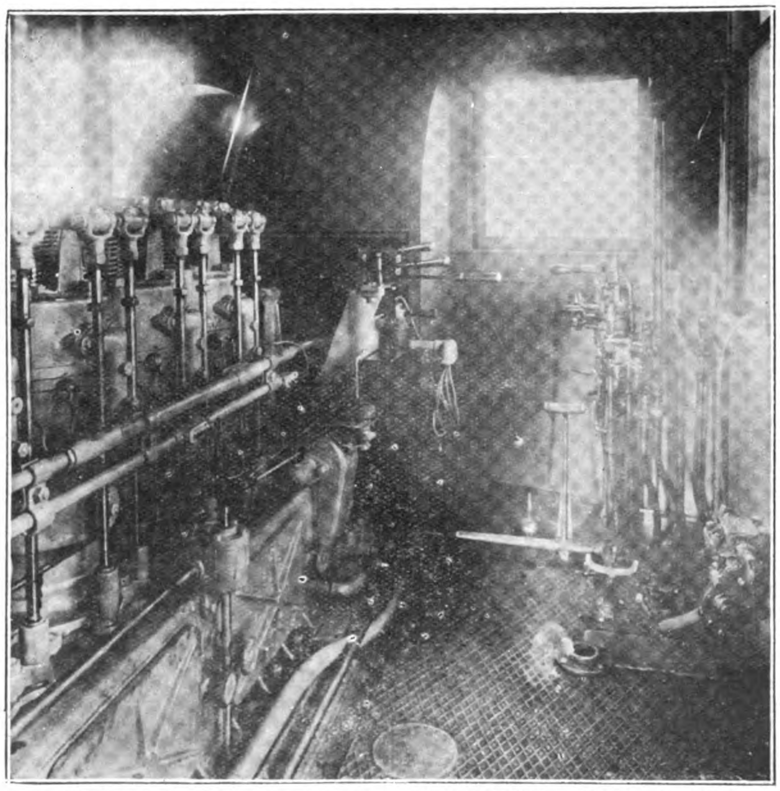
THE last few years have witnessed great strides in the development of railway transportation. The phenomenal increase in operating costs and the serious competition of motor-bus lines on the short haul traffic, has caused the railway officials a great deal of thought in both the United States and Europe.

The problem of cutting these costs were taken up by the manufacturers of railway equipment, and one of the solutions offered was the motor coach. These coaches are equipped with internal combustion engines, from which the locomotive and lighting power is derived.

The first railway in the Far East to adopt these coaches was the British section of the Kowloon-Canton railway. Two of these coaches arrived at Kowloon in the early part of December 1921 and during the past year have proved entirely satisfactory. The directors of the Manila Railway Company are now recommending the use of similar cars in order to compete with the increasing number of motor passenger and freight autobuses, and from Korea we learn that the authorities have abandoned the idea of electrifying the Seoul-Jinsen (Chemulpo) line at an estimated cost of Y.1,800,000, in favor of automotive railway cars, which can be purchased for Y.300,000. Other parts of the Far East are also confronting similar transportation problems arising from the loss of revenues through motor competition. With railway operating costs mounting higher each year attention is being attracted to the employment of a more economical transportation medium, by applying motor trucks to traffic problems.

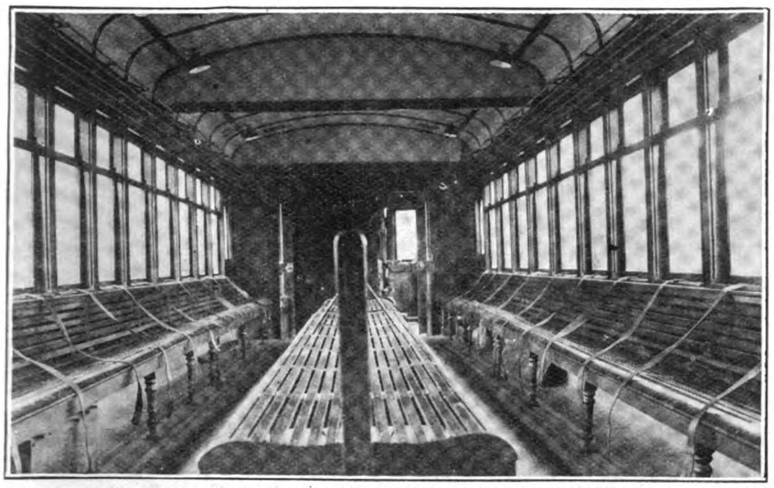
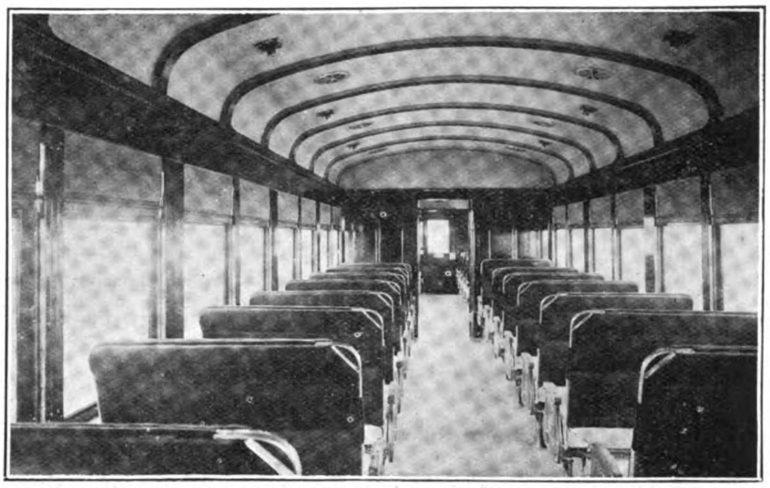
The motor coaches and trailers for the Kowloon-Canton railway were supplied by the Hall-Scott Motor Company of Berkeley, California.

The car bodies are of steel construction throughout, measuring 61-ft. 11½-in. over sills, the interiors finished in west coast mahogany, the first-class compartment being fitted with seats upholstered in imitation leather, and the second and third with hardwood slat seats. The coaches and trailer are lighted throughout with electric lights by means of a 3½ K.W. Delco internal combustion engine, ceiling fans being provided in the first-class compartment.



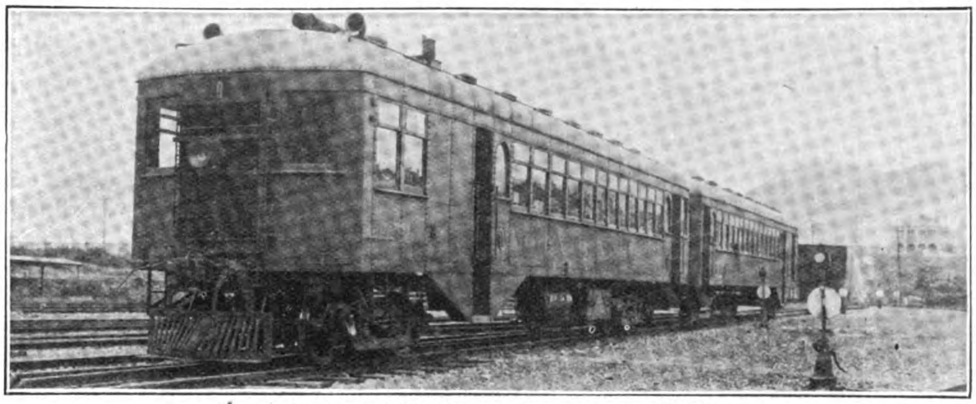
Interior of the Motor Compartment of the Hall-Scott Motor Coaches for the Kowloon-Canton Railway

The motor coach power consists of a Hall-Scott M-6 type 150 h.p. 6-cylinder engine with cylinders 8-in. by 10-in. adapted for using kerosine as fuel. The motor is equipped with high-tension magneto and distributor with coil and battery connection providing two separate sets of ignition entirely independent of each other and running to two sets of spark plugs. Carburetor is of the float feed type. The air compressor is of two cylinder water cooled type with cylinders 4-in. by 4-in. directly driven from engine. The engine is equipped with

INTERIOR VIEWS OF PASSENGER COMPARTMENTS OF THE NEW MOTOR COACHES FOR THE KOWLOON-CANTON RAILWAY
Third Class — First and Second Class

electric starter. Engine cooling is provided by means of a vertical copper tube radiator with large diameter belt driven fan in connection. A 75-gallon storage tank is installed on the car underframe with pipe leads to side wall, double compartment kerosine and gasoline gravity tank, suction pump driven directly from engine to main tank for carburetor feed ; gasoline compartment of gravity tank providing for initial starting of engine.



Motor Coach and Trailer, Kowloon-Canton Railway

Transmission is of the selective type allowing of four speed changes in either direction.

On the level the motor coach can run up to 50 miles per hour, or with trailer 40 miles, the combined seating capacity being 90 third-class, 36 first and 36 second and luggage compartment. The coaches are fitted with Westinghouse quick-acting and straight-air brakes.

A HYDRAULIC PILE

(Continued from page 751)

there are no boulders to be encountered, you can make the casting as thin everywhere as it is practicable to pour it.

The timbers are to be bolted to the casting so firmly that there will be no chance for detachment during driving. The splices, if of steel, are to be made with $\frac{5}{16}$-in. by 35-in. plates, 4-ft. 4-in. long, bent to a right angle, and bored for the passage of wood-screws $5\frac{1}{2}$-in. long under head—but no longer. As shown on the drawing, the arrangement of the holes must involve staggering on the two sides of the bent plate, so as to avoid clashing of screws.

As before indicated, under certain conditions plank scabs $2\frac{1}{2}$-in. by 17-in. by 3 or 4-ft. long with beveled lower edge can be used the thickness at the lower end being about $\frac{1}{2}$-in.; this to provide for going through hard material such as gravel or boulders.

The four timbers forming the pile are to be screw-bolted together with $\frac{3}{4}$-in. bolts and cast-iron washers—all as shown on the drawings. There is no need whatsoever for sinking these washers into the timber in order to avoid friction.

There is to be a 4-in. extra-strength pipe cut into lengths convenient for handling and attaching, with the usual couplings that turn in a right-handed direction. The connection of the pile to the casting, however, must be left-handed, so that by twisting the long pipe in a right-handed direction it will be detached therefrom after the pile is driven. On this account, whenever an extra length is being added to the pipe, the part already in place must be held tightly by tongs so as to prevent any turning thereof.

At the top of the pipe there is to be a goose-neck, attached by ordinary couplings, with some kind of a quickly-made connection to the 4-in. hose leading to the pump.

This hose is to be of the very strongest kind procurable, so as to permit of a high water pressure—say 200 lb. per square inch.

For the timber I would suggest Oregon fir cut *full size* so that the pile, when finished, will square all of 18-in. If the timber be purchased in a large quantity, the odd size will cost almost nothing extra, except for the larger amount of timber used. Of course, timber of standard market section, which is always a little less than the nominal section, can be used, but it will not be quite so convenient. It might be found after trial that it would pay to have all timber dressed full size on all four faces, but I anticipate that this refinement will not be needed.

Of course, care must be taken to stagger the long screwbolts attaching the component timbers, in order to avoid interference and the unnecessary weakening of the timber section at any point.

Holes will have to be bored full-size or even $\frac{1}{16}$-in. greater for the long screw-bolts ; but only very small holes should be used for the short wood-screws. Possibly these holes may be omitted altogether, but I think not.

If any trouble be experienced in making the casting in China, it can be divided into two parts by a plane on A. B, but in that case the total thickness of the two adjoining bases should be $2\frac{1}{2}$-in. or $1\frac{1}{4}$-in. each. These two castings would have to be bolted together by a number of turned 1-in. or $1\frac{1}{4}$-in. bolts in drilled holes.

All bolt-holes in the casting would have to be drilled.

The volume of water used would have to be about 500 gallons per minute, at least, and possibly somewhat more, all depending upon the character of the soil to be penetrated. It is true that in some of my work I have used 350 gallons per minute and have found this to be sufficient, but I believe that the larger amount would be preferable.

Japanese House Buys $50,000,000 Yearly in U.S.

Mitsubishi Interests Controlling Eleven Separate Enterprises, Employing 100,000 Men, Large Importers of American Products

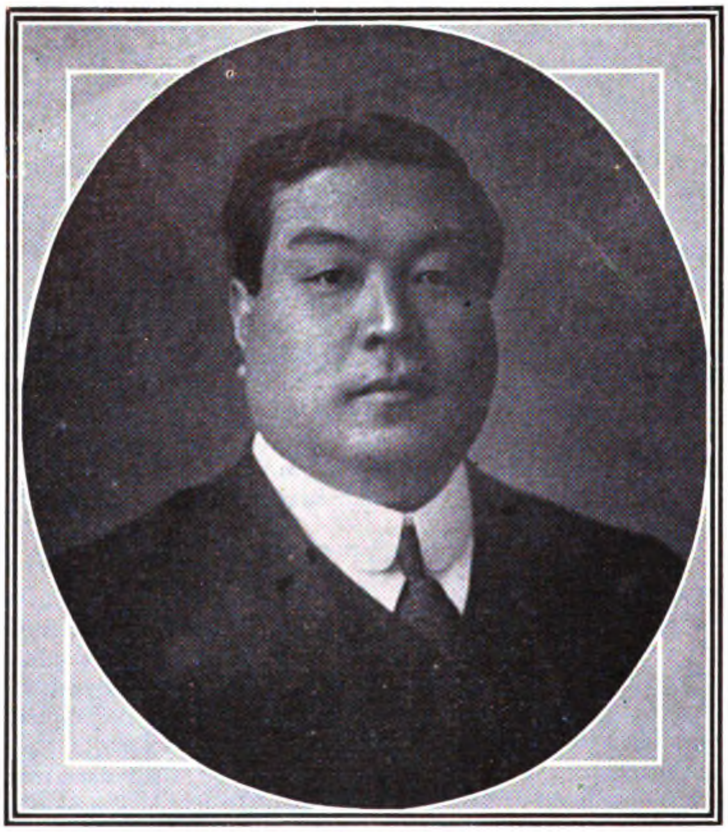
By A. V. Gilleaudeau in the "American Exporter"

FIFTY million dollars a year or almost one million dollars a week! Such is the average value of the purchases of American goods made by the New York branch of a large Japanese trading company for its principals in the Orient. In this fact alone there is a story of interest and significance to merchants everywhere.

The products which the Mitsubishi Company buys in the United States include machinery of all kinds, machine tools, motor cars, lorries and tractors, iron and steel products, electrical installations, freight handling and conveying equipment, construction material and many other lines.

The company has its headquarters in Tokyo, with branches in all the principal cities of Japan, as well as in China, India, Australia, Siberia, Dutch East Indies, Straits Settlements and the Philippine Islands. In addition to two branch offices in the United States, in New York and Seattle, Wash., the company likewise maintains several European offices.

The Mitsubishi Trading Company buys in the United States not only for the account of its principals in Japan but on indent for its customers in the various markets in which it operates. The variety of goods which it is called upon to purchase in the United States is indicated by the fact that the Mitsubishi interests in Japan control eleven separate enterprises employing some 100,000 men. Among these enterprises, most of which are large importers of American goods, are ship-building yards, iron and steel mills, paper mills, machinery plants, glass factories, canneries, a warehousing company, engineering works and others. The trading company, which is specifically occupied with a general import and export business, is an outgrowth of the requirements of these various interests. Organized in 1918 to import the requisite supplies for these interests and dispose of their products in foreign markets it has since then developed an important import and export business on its own account.



Baron Koyata Iwasaki
Head of the Great Mitsubishi Interests in Japan

The Mitsubishi Head Office at Tokyo

Departments Are Under Direction of Specialists

The New York office of the Mitsubishi Trading Company employs 55 people and its business is carried on by six different departments. These departments deal respectively with machinery, metals, general merchandise, coal, oil and steamships. The heads of these departments are specialists of long experience in their individual lines, with thorough knowledge of requirements of the markets in which the company operates. As is necessarily the case in the transaction of a business of so large an aggregate volume, accuracy and detailed instructions to manufacturers are characteristic of the buying policy of the New York branch. All orders to American manufacturers are detailed, specific and comprehensive, and are embodied in a special form of contract evolved by the house. Orders are accompanied by explicit instructions covering packing, marking, invoices and necessary documents. Careful attention to these details, the New York office has found, eliminates error and delay in securing the desired merchandise.

The buying policy of the house is that of shrewd and progressive merchants everywhere. Large stocks of readily salable merchandise are bought for, and carried by, the various branch offices in the Orient. Samples of such merchandise as textiles, provisions and certain types of machinery are on display in these branches. Bulk goods such as heavy chemicals, fertilizers, grain, iron

and steel products, etc., are always stocked. The New York branch, when it observes that the demand for American products in any line in especially active, takes measures to anticipate the requirements of its principals for some time in advance.

Research Department Keeps in Touch with Market Conditions

One of the progressive features of the New York branch of the company is a well-staffed research department whose function it is to keep in close touch with market conditions throughout the United States, and which through export journals and other sources of information is always well posted with respect to new trends in manufacturing as well as new and successful merchandising ideas as they are developed. Constant vigilance and careful attention to these developments as they occur has been found by the New York branch to be extremely profitable, since it has on many occasions been able first to introduce improved equipment or merchandise to its markets abroad.

THE NEW MITSUBISHI BANK AT TOKYO

The architecture and equipment has been adopted from one of the most famous banks in New York City, and much of the equipment imported from the United States. The bronze doors were specially made in the U. S. at a cost of $45,000. All the tiling of the large banking floor was made by an American manufacturer; the rugs and carpets used in the building were ordered from a firm of prominent American decorators, and the safe deposit vaults were bought in the U.S. at a cost of $60,000.

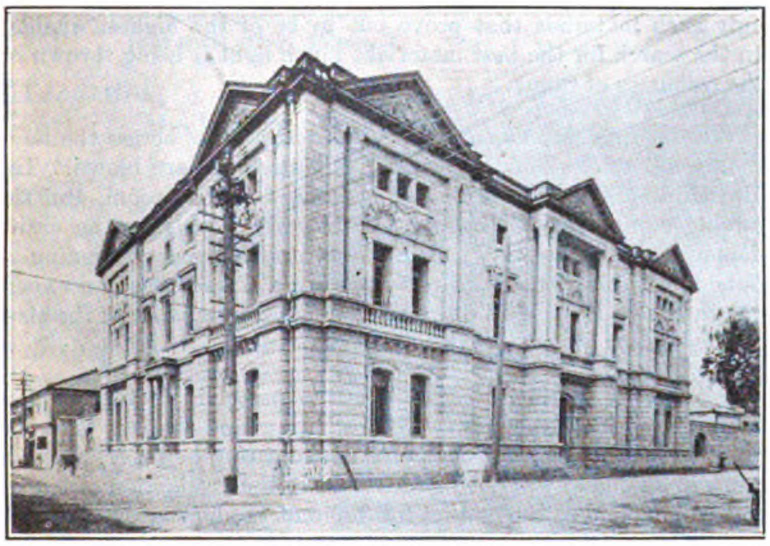
Another function of the New York buying office of the company is to secure the agency for its markets of attractive and suitable American merchandise. At the present time it acts as sole agents in these markets for several American manufacturers of motor cars and lorries, machinery and machine tools, electrical materials and machinery, tyres, tubes and mechanical rubber goods.

Transactions Are on a Big Scale

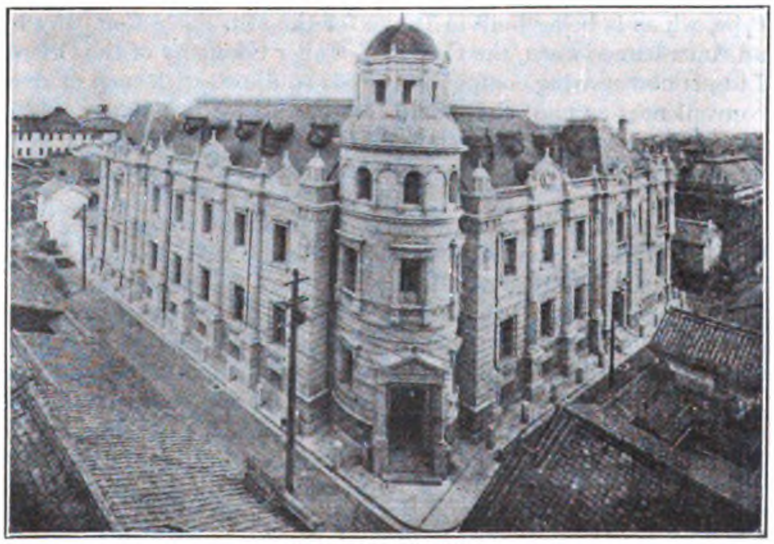
These and other similar lines are handled in the Far-Eastern branches of the Mitsubishi Trading Company, in very much the controlled by the Mitsubishi interests in the Orient, for the Japanese government, and for large industrial establishments in Japan which the company numbers among its customers. The purchases of the company in the American market are therefore unusual and somewhat remarkable both in respect to diversity and importance.

For example, during the first months of 1922, the New York office bought 70,000 tons of steel materials at a cost of some $3,000,-000, 30,000 tons of which were steel rails purchased for the Imperial Railways of Japan. Recently the Mitsubishi Warehouse Company which operates as shipping and forwarding agents, custom-brokers and wharfingers in the principal ports of Japan, decided to build a new wharf. The company sent its own engineers to the United States to study as models the army and navy bases in the principal American ports. These engineers upon the conclusion of their investigation returned to Japan, drew their plans, sent the specifications to the New York buying office, and bids called for from American manufacturers for the supply of the complete equipment required.

It is interesting to note that the warehouses of the Mitsubishi Warehouse Company, which cover a total of 150 acres in the principal ports of Japan, were modeled entirely upon similar developments in the United States. The sheds and warehouses, with few exceptions, are built of brick and stone with iron frames, and are equipped with automatic sprinkling systems, hydrants, fire-extinguishers and automatic fire-proof doors, all of which were imported from the United States. Similarly, the electric cranes and automatic freight handling equipment were bought from American manufacturers.



Kobe Branch Office



Osaka Branch Office

same way as they are in the United States. Large stocks are carried and a great deal of attention is devoted by the company to adequate and attractive display of goods and to sales promotion.

By far the largest proportion of the business transacted by the New York office is for the account of the various enterprises

Another large order recently placed by the New York office shows the progressiveness of the house in its policy of introducing improved machinery and equipment. This order, given by the Japanese government, called for the purchase of a ship-stabilizer weighing 170 tons, the largest ever built in the United States.

The Mitsubishi Bank, Ltd, recently completed the construction of an imposing building in the Marunouchi district of Tokyo, where the Mitsubishi interests are erecting a number of office buildings similar to those lately erected in the United States. The architecture and equipment of the new banking house is adapted from that of one of the most famous banks in New York. The vaults, for example, were bought in the United States, at a cost of $60,000. The bronze doors, which cost $45,000, were likewise bought in the United States. The entire tiling of the enormous banking floor was specially made by an American manufacturer, and all the rugs and carpets used in the building were ordered from a prominent firm of American decorators.

These examples indicate the unusual buying problems which from time to time confront the Mitsubishi office in New York. Concurrently, however, the buyers are occupied with less spectacular, if no less important activities. The general merchandise department purchases and ships to the Orient large quantities of grain, fertilizer and heavy chemicals. The machinery department is constantly sending forward such goods as cranes, pneumatic hammers, welding machinery, lathes, cotton-spinning machinery, elevators, switchboards and meters. It does a considerable volume of business in motor cars and lorries, tractors, and automative products generally.

It frequently is called upon to purchase complete equipment for some new plant belonging to one of the several Mitsubishi enterprises, such as, for instance, a large installation of paper-making machinery bought some time ago for the Mitsubishi Paper Mills. Similarly, the machinery department has purchased in the United States rollers and furnaces for the large iron and steel works controlled by the Mitsubishi interests, and mining machinery for its coal and iron mines.

The activities of the various Mitsubishi enterprises for which the trading company buys in the United States, and the merchandising activities of the trading company itself in the Far East illustrate the thorough and consistent application of principles and methods characteristic of business in the United States. The showrooms of the Mitsubishi Trading Company in the Orient are well adopted to the demonstration of machinery and adequate display of goods, and are provided with all the facilities for effective merchandising which are incorporated in similar buildings in the United States.

The Marunouchi building, a modern office structure of American type, which is being built in Tokyo for the Mitsubishi Company by an American concern, the George A. Fuller Company of the Orient, Ltd., is now nearing completion. It is equipped with such modern conveniences as mail chutes, heating and water supply systems of the most up-to-date type, and has 11 elevators. The ground floor is traversed by two arcades, which are lined with about 30 shops.

An idea widely employed by large industrial enterprises in the United States, the formation of organizations of their employees, has been successfully adopted in the Mitsubishi Club, an association with a membership of 9,000, having 47 branches throughout Japan. The club is instrumental in fostering the spirit of the various enterprises under Mitsubishi control through its several activities. Among the most characteristic of these are the publication of a magazine for the employees, and the maintenance of a building in Tokyo to provide living quarters for bachelor members of the staff.

American Enterprise in China

(Continued from page 747)

tested, each new lamp taking the place of a lamp which has gone through the test and come out in perfect condition. Further along, there is a line of desks, at which work the skilled filament winders, weaving the hair-like Tungsten wire on to the fish hook supports in the lamp. This fine drawn Tungsten wire, which is the most important element in the lamp, is, and always will be, imported from the general electric factories in America. The lamps go from process to process and at each step are handled by women who have proved best able to do the work accurately and well. The pay is either piece-work or on an hourly basis, as each particular job requires. The increased speed and productiveness of the workers, has justified this factory paying fifty per cent. more than any native manufacturers, but this is done only because of the increased demand for efficiency and care.

As each step is finished, the lamps are carried on large racks from process to process by men. Back in the boiler room and machine shop men do the work, the packing also is a man's job. And as packing in the Orient, for rough handling and humid climate, represents special problems, special attention has been given it. Lamps are wrapped and packed for export in strong wooden boxes so as to prevent breakage and effects of weather. Thus each type of work is suited to the worker, so as to bring the best results.

Good conditions of labor have been maintained as well. The American manager believes the largest results are obtained under conditions similar to those in the United States. Instead of going to long hours and seven day work, the factory has maintained ten hours of work a day, six days a week, the factory being closed on Sundays. Such hours and a full day of rest each week is a thing previously unknown in China.

Child labor will never be an issue in the factory, for no one under sixteen years of age is employed. Due to complete protection against accident, the factory holds a record of no serious accidents since lamp product is began. Such high standards of factory labor react not only towards the most efficient and high quality of production in this factory, but also are the most telling example to the factories in this country, where the tendency is towards the sweat shop conditions so long ago condemned in America.

With expert supervision, and connected and efficient labor, the remaining element in producing good lamps, is raw material. So far as is consistent with the best results, China is made the source of supply. The wire, as already stated, is imported from America and so are certain of the chemicals and brass parts, but glass sand and all other materials are purchased locally, the factory taking only such materials that prove out to be of the highest quality. In the search for the best materials, much light is being thrown on the resources of China.

From the lamp factory itself, the visitor goes across the large roomy lot, to the building where the glass bulbs are blown. The glass furnaces, the bulb blowing moulds, the tube room, and the mixing equipment, all have a capacity for supplying the entire demands of the factory, thus eliminating the need of trusting to outside factories for any of the glass work. The American expert can thus keep track from day to day of the exact quality of the glass that goes into every G. E. Edison lamp.

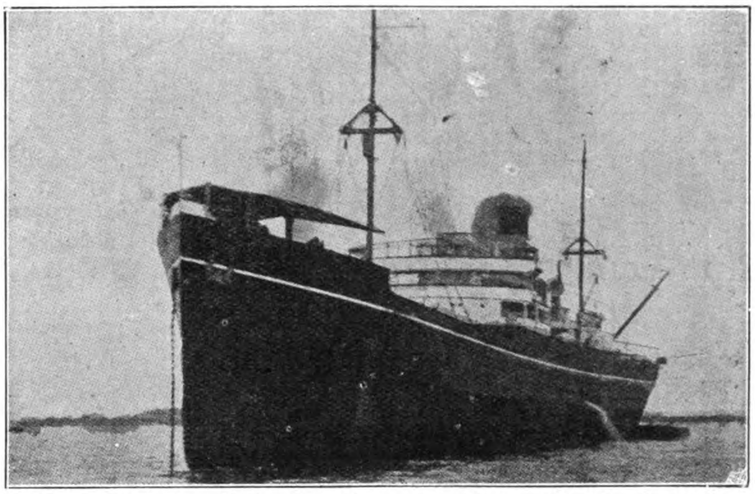
Adjacent to the glass house is the porcelain factory, a new building where production of porcelain wiring devices is under way, but this is another department, indicating however, that the work in Shanghai will not be restricted to the production of lamps, but will expand as the market for different products grows.

As the visitor leaves the open grounds of the China General Edison Company, the American flag at the entrance typifies for him with new meaning, the fact that here a group of Americans are building up a branch of the general electric organization with the same standards as those maintained at home. "Made in China" means in this case, good quality, high efficiency and long life in G. E. Edison lamps.

Electrically-Propelled Cargo Ship "Biyo Maru"

8,800 Tons d.w. on 25-ft. 9-in. Draft. Built by the Asano Shipbuilding Company, Tsurumi, Japan, with Engines by the Ljungstrom Turbine Company, Limited, Finspong, Sweden

THERE has lately been added to the fleet of the Toyo Kisen Kaisha, of Japan, an electrically-propelled cargo ship of 8,800 tons d.w., which it is claimed is the first electrically-propelled merchant ship to be built in Japan. The vessel, the *Biyo Maru*, launched on December 22, last, is one of nine cargo-ships which are building for the same owners by the Asano Shipbuilding Company, of Tsurumi, near Yokohama.



The "Biyo Maru," the first Japanese-built Electrically-propelled Steamer

The vessel is of the shelter deck type with long bridge, forecastle and poop. The hull is sub-divided by means of six water-tight bulkheads giving, in addition to the usual fore and aft peak tanks, two cargo holds forward and two aft, the propelling machinery being placed amidships. There is a double bottom running the entire length of the hull, this being employed for the storage of oil fuel, and also for water ballast. The officers' quarters are situated on the bridge deck, with the exception of the captain's cabin, which is on the navigating bridge, and the crew are berthed in spacious quarters in the forecastle.

The principal dimensions are as follows:

Length, between perpendiculars	400-ft. 0-in.
Breadth, moulded	53-ft. 0-in.
Depth, moulded	32-ft. 0-in.
'Tween deck height	10-ft. 0-in.
Gross tonnage	5,479 tons.
Load draught	25-ft. 9-in.
Dead weight carrying capacity	8,800 tons
Designed speed at sea	11 knots

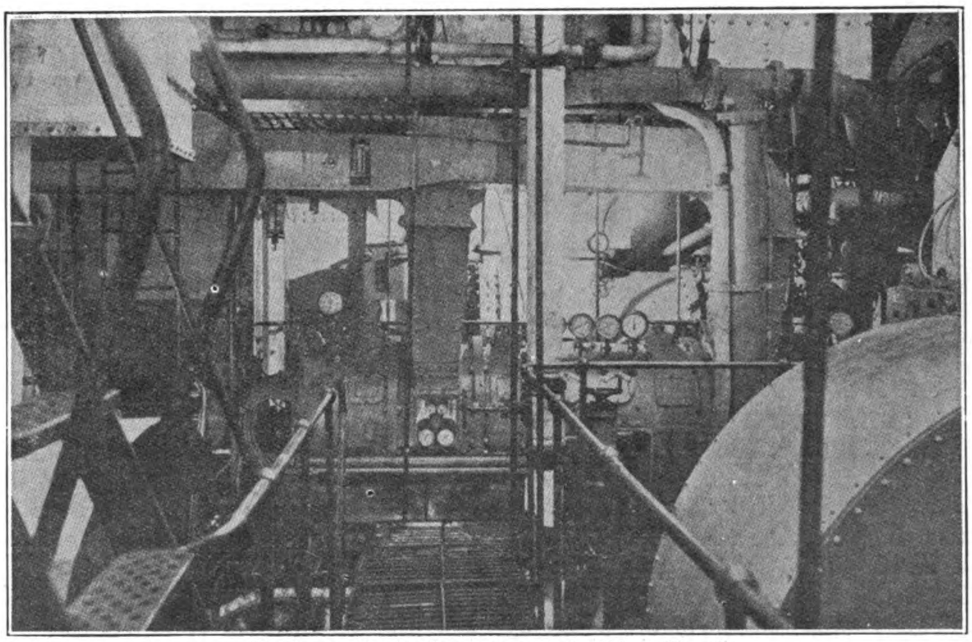
Propelling Machinery

Particular interest attaches to the propelling machinery of this vessel. It consists of two sets of Ljungstrom turbines, each turbine driving two electric generators. The current from these generators is supplied to two induction motors which drive the propeller shaft through single reduction gearing of the usual double helical tooth pattern. This machinery has all been manufactured by the Svenska Turbinfabriks Aktiebolaget Ljungstrom, at Finspong, Sweden, and its arrangement in the engine-room is shown in the drawing reproduction on page a photograph of the engine-room being reproduced on page . The trubines, of the usual Ljungstrom type, are of the radial flow double rotation pattern, and are designed to work with steam at a present of 225-lb. per sq. in., superheated to 650 degree Fahr. at the inlet valve and exhausting into a vacuum of 29-in. Each turbine has two discs of blading turning in opposite directions, these being coupled to two three-phase alternating current self-exciting type generators having revolving fields.

Each generator is designed to be run at a speed of 3,600 r.p.m. and to give three-phase alternating current of 1,000 volts at 60 cycles per second. Each turbine, with its generators, is mounted on a surface condenser, which rests on a strong steel plate girder foundation. Each of the induction motors develops 1,360 h.p., the normal speed of rotation being 600 r.p.m.

The reduction gearing consists of a large double helical toothed spur wheel and two pinions, each of which is coupled to one of the induction motors. The ratio of reduction is about 7.5 to 1, so that the normal speed of rotation of the propeller shaft is 80 r.p.m., which corresponds to a speed of the ship about 11 knots when fully loaded.

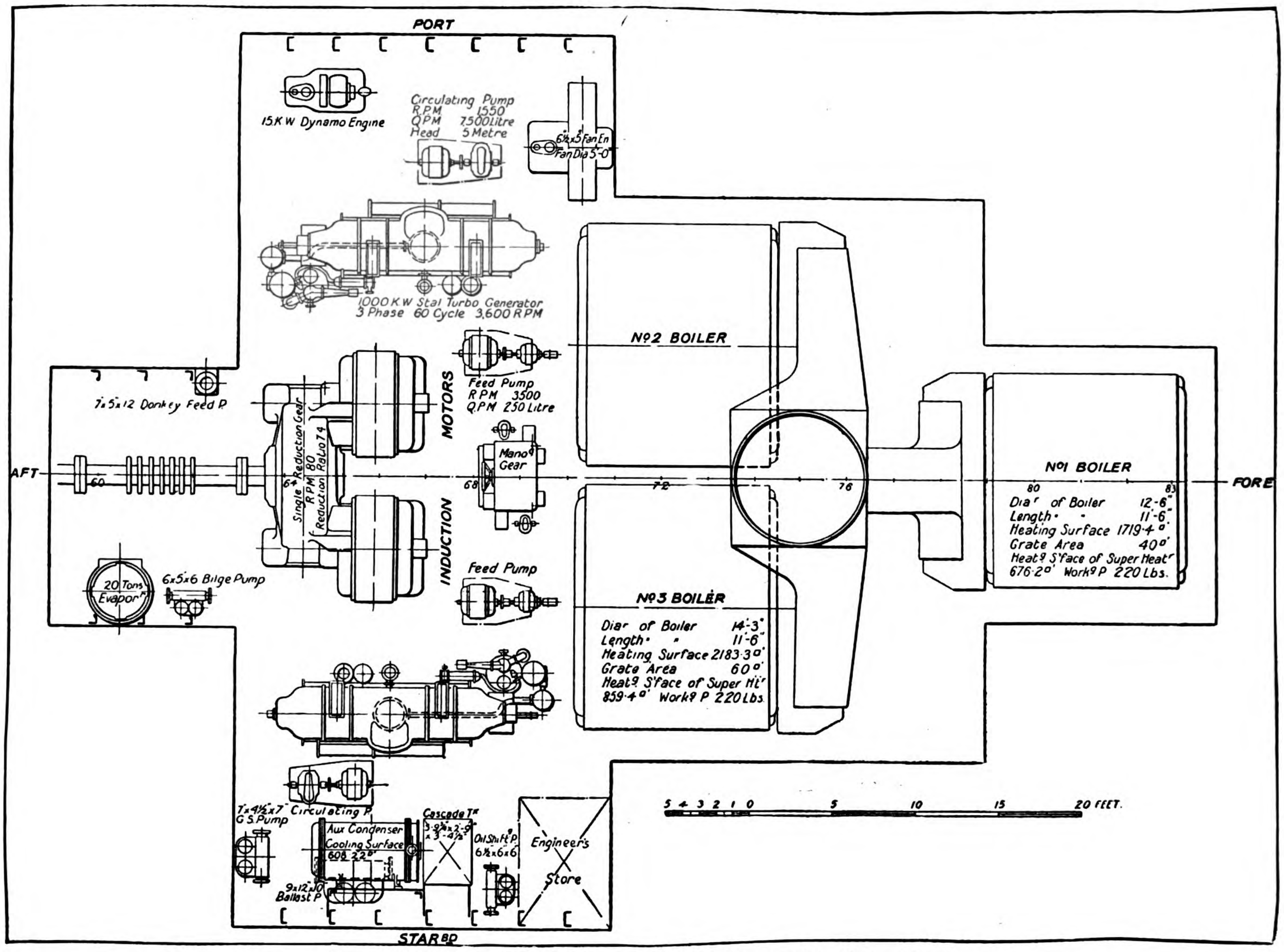
The main manœuvring gear is a rectangular pillar stand containing switches, electrometres, and the liquid type resistance, and is worked with a large hand wheel in the front.



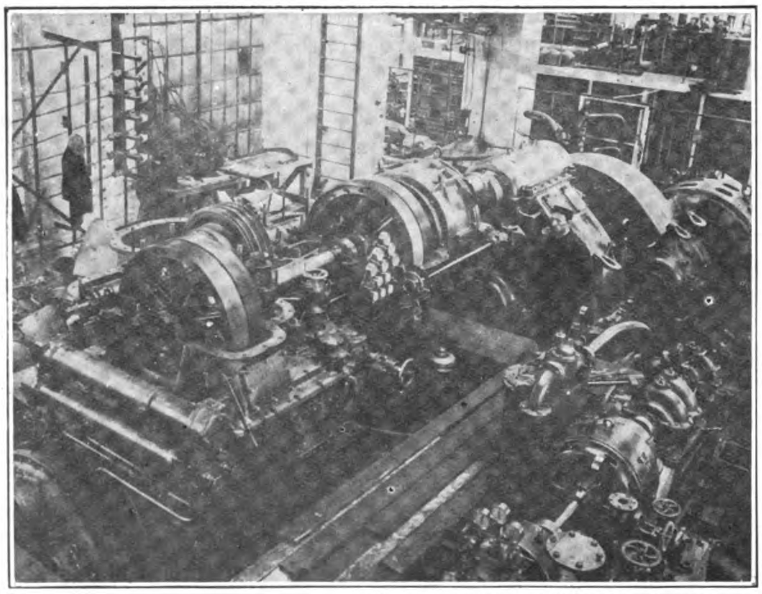
Starboard Turbo-Generator of the "Biyo Maru"

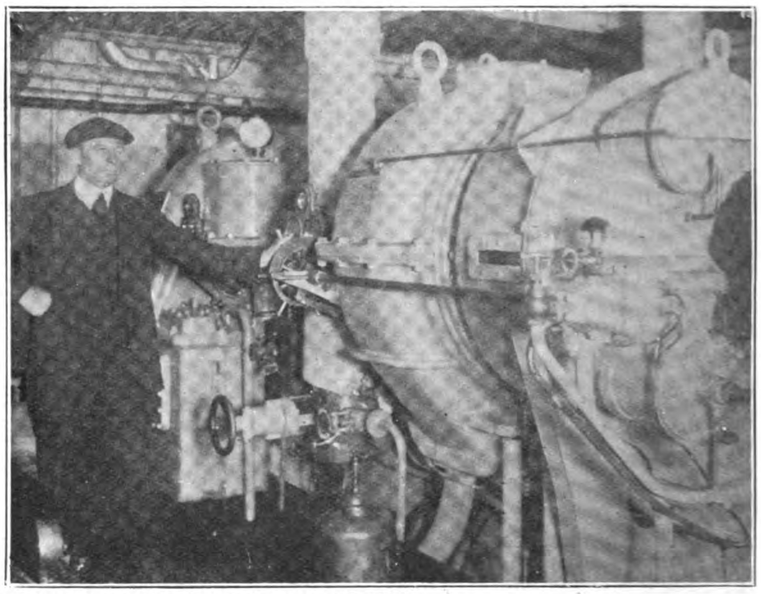
Auxiliary Machinery

The auxiliary machinery is all electrically-driven, each unit being fitted with a separate induction motor taking current from main generators. It comprises two sets of air pumps, operating on the kinetic system, two circulating pumps of the centrifugal type. The other auxiliary machinery in the engine and boiler rooms is steam-driven, and includes the following:—



General Arrangement of Machinery and Boiler Spaces of the "Biyo Maru"





"STAL" (LJUNGSTROM) TURBINE MACHINERY FOR SHIP PROPULSION

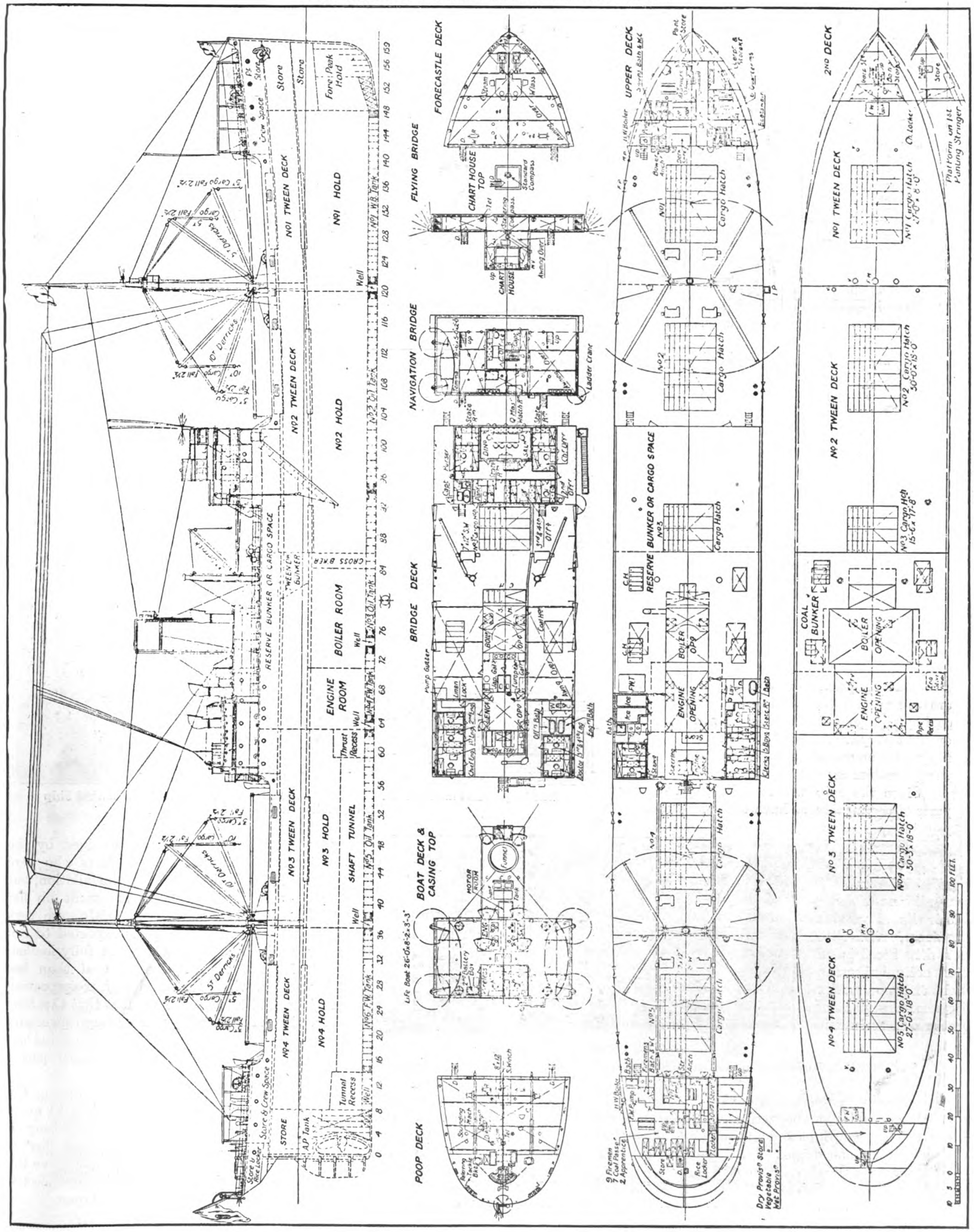
2,500 I.H.P. Turbo-Propulsion Set under Erection — **2,500 I.H.P. Turbo-Machinery installed in the s.s. "Pacific"**

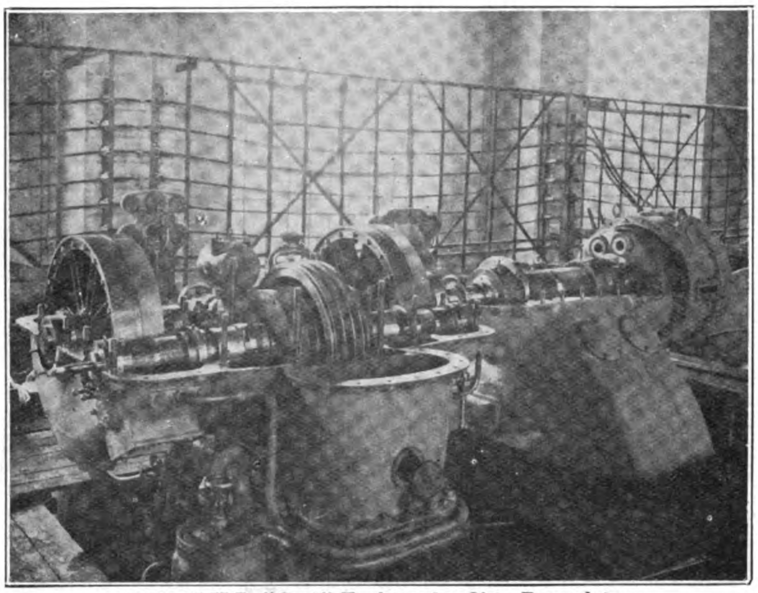
One simplex double-acting donkey feed pump, 7-in. by 5-in. by 12-in. one duplex double-acting general service pump, 7-in. by 4½-in. by 7-in.; one duplex double-acting ballast pump, 9-in. by 12-in. by 10-in.; one duplex double-acting bilge pump, 6-in. by 5-in. by 6-in.; one duplex double-acting fuel oil pump, 6½-in. by 6-in. by 6-in.; and a fan engine for harbor use, 6½-in. by 5-in. In addition there is an ash-hoisting engine, evaporator, auxiliary condenser, feed-water heater, feed-water filter, two fuel oil pumps, and a small fuel-oil gravity tank.

The ship is lighted throughout by electricity, and for this purpose there is a motor generator set taking the current from the main generators. There is also a steam-driven generator for harbor use.

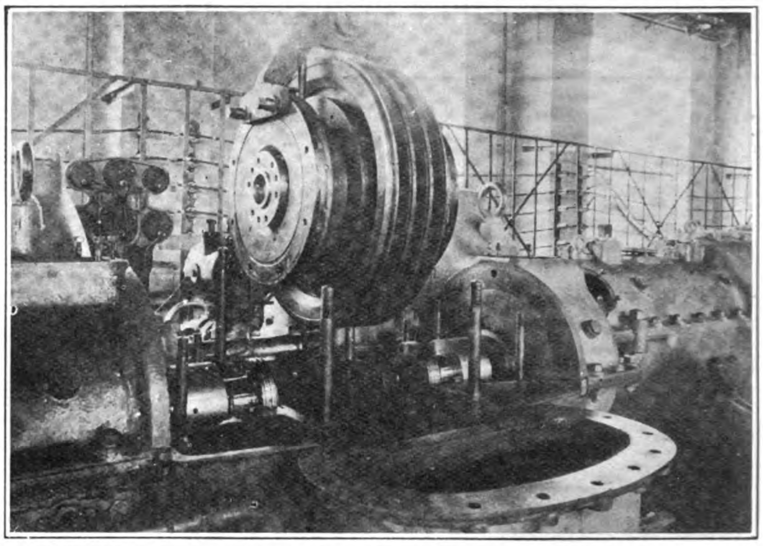
THE FIRST ELECTRICALLY-PROPELLED SHIP IN JAPAN, THE "BIYO MARU"

Built by the Asano Shipbuilding Company, Tsurumi, Japan





A 1,350 I.H.P. "Stal" Turbine for Ship Propulsion



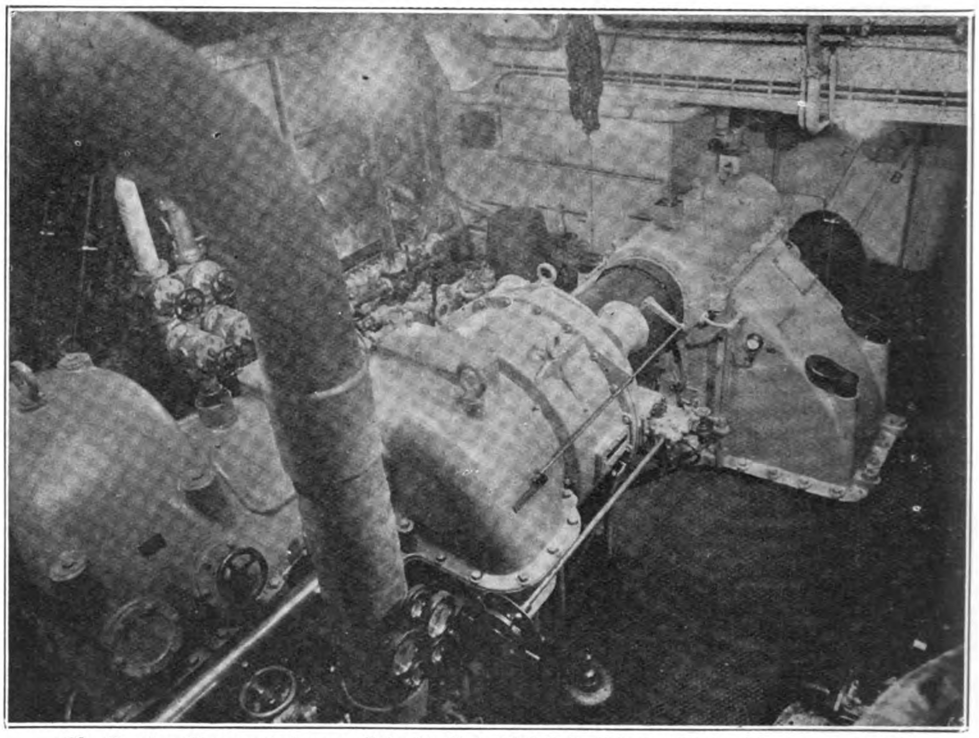
1,350 I.H.P. "Stal" Turbo-Propelling Machinery with the Blading Removed

The propeller is 17-ft. 9-in. in diameter, and with blades having a pitch of 16-ft. 1½-in. The blades are four in number, and are of manganese bronze attached to a cast-iron hub. The thrust of the propeller is balanced by means of a large ball thrust bearing attached to the forward end of the gear wheel shaft, but, in addition, an ordinary horse-shoe type thrust bearing is fitted.

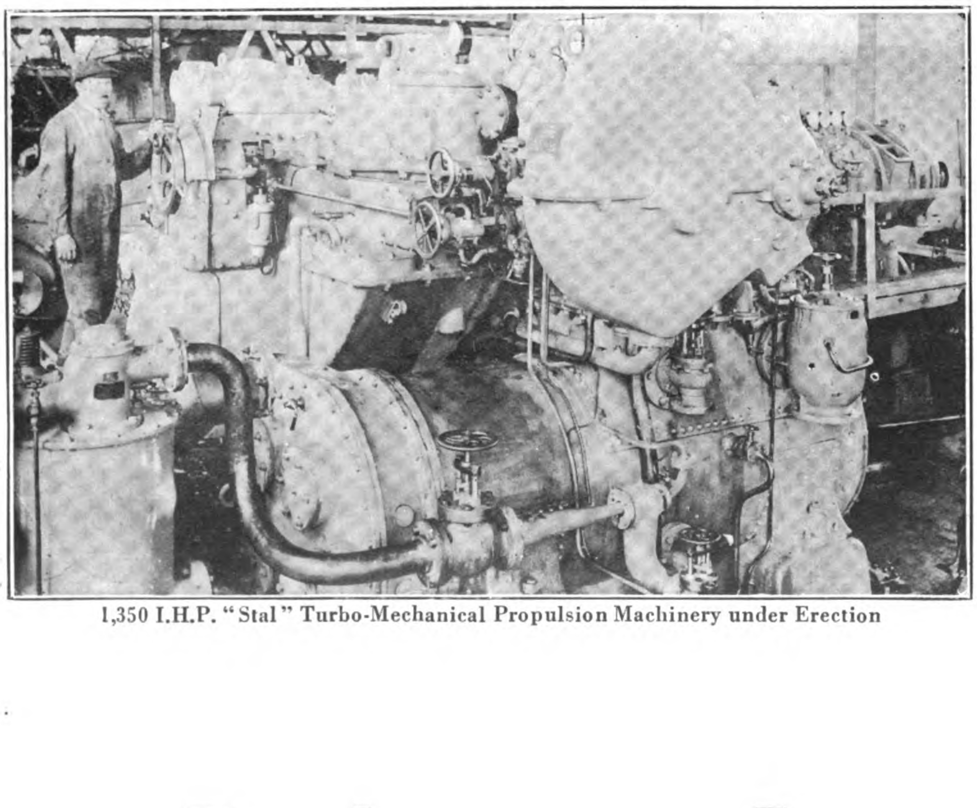
Boilers

Steam is supplied by three single-ended Scotch boilers, two of these being 14-ft. 3-in. in diameter and 11-ft. 6-in. long, having three corrugated furnaces, and one 12-ft. 6-in. long, having two corrugated furnaces. The boilers are designed for a working pressure of 225-lb. per sq. in. gauge, and to burn either coal or oil alone or coal and oil mixed. Howden's system of forced draught is adopted. For this purpose air trunks are led from the generators, the air used for cooling the generators being utilized for forced draught purposes. It is for this reason that the fan engine enumerated above is used only when the generators are not working.

Since the ship was launched, some minor parts of the machinery have undergone changes as a result of the experience gained by the engineers of the machinery builders who were attending the fitting-out of the installation, but finally early in May, 1921, she went on her trial trips. The results of the trials were very satisfactory, and the vessel is expected to run very easily over 11 knots when fully loaded, with for less consumption of coal than her sister ships, which are fitted with reciprocating engines, and this despite the fact that the *Biyo Maru* has a considerably greater cargo space and consequent increased deadweight carrying capacity in view of her reduced machinery space.



The Engine Room of the s.s. "Pacific," 2,500 I.H.P. "Stal" Turbo-Mechanical Ship Propulsion Machinery



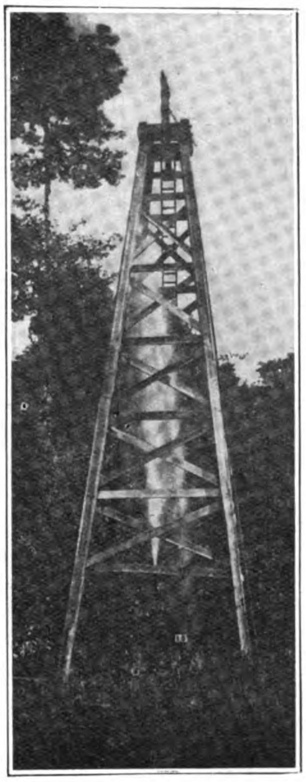
1,350 I.H.P. "Stal" Turbo-Mechanical Propulsion Machinery under Erection

The Toyo Kisen Kaisha were among the first steamship owners in the world to make practical use of mineral oil for steam raising on ocean-going steamers, as they tried this as early as the year 1908. They now have the honor of being the owners of the first electrically-propelled merchant vessel in Japan.

Oil Fields of the Dutch Indies

A RECENT consular report contains the following particulars of the various known oil fields in the Dutch East Indies :—

Northern Sumatra.—The Peureula (or Perlak) field, in the government of Atjeh, has a dome-shaped anticline, in which over 200 wells have been drilled. The oil-bearing strata were found at depths varying from 100 to 600 metres, the specific gravity of the oil being .770. The water-flush system of drilling was used at first, but later replaced by Canadian machinery and standard rigs. There are two pipe lines (one for oil and the other for gas), which carry the products to the Bataafsche refinery at Pangkalan Brandan, 120 kilometres away. The production in 1900 was 6,978 tons, 286,075 in 1909, 132,560 in 1919, and 129,800 tons in 1920. The concession is owned by the Perlak Petroleum Maatschappij, an independent company with headquarters at The Hague, but the field is operated on a contract or royalty basis by the Bataafsche Petroleum Maatschappij.



A Sumatra Gusher

The Zuid Perlak concession is owned and operated by the Zuid Perlak Petroleum Maatschappij, of The Hague, also an independent company, but the output is sold to the Bataafsche refinery at Pangkalan Brandan at market prices. The production in 1920 amounted to 8,235 tons.

The Telaga Said field, in the Langkat district, is described as having a petroliferous formation, which is probably of Tertiary age, and consists of a belt of coarse, uncemented blue to grey sandstone of characteristic appearance, interstratified with marls and shales, east of the mountain range, on the slopes of which, as well as ten to twelve miles eastward on the coast, oil outflows abound. The anticline of this field, forming a dome, is about 30 kilometres in length and from 500 to 1,000 metres in width. The specific gravity of the oil is from .765 to .770. The water-flush system of drilling was used in the beginning, but later Canadian machinery and standard rigs have been used. A refinery was built at Pangkalan Brandan in 1891, since much enlarged, to which the oil is brought through pipe lines. The production from this field, however, is very much diminished.

The Boeloe Telang field is on the same anticline as the Telega Said, in the Langkat district, but the oil is heavier, having a specific gravity of .785. The owners of this concession built a small refinery on the Tandjoeng Poera River to take care of their production. In 1915 the refinery was closed down, and a contract was made with the Bataafsche Petroleum Maatschappij to take all of the crude at a reported price of 30s. per ton. All efforts to reach additional supplies of oil at lower levels on this field have failed, and it is believed to be rapidly approaching exhaustion. Various systems of drilling were used, but principally Canadian machinery.

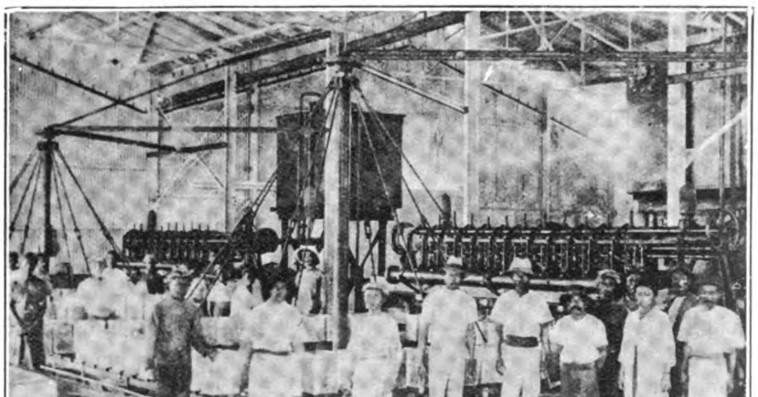
The Southern Sumatra Fields.—The most important concession in this area are the Moeara Enim, Babat, Soeban Djerigi, Soeban Boeroeng, and Ramok, in the order of their 1920 production. They are all situated in the residency of Palembang.

The Moeara Enim field was brought into production in 1900. The rights were purchased by the Moeara Enim Petroleum Mij., which company built a refinery at Pladjoe, on the Moesi river, a short distance below the town of Palembang. A pipe line was built from the wells to the refinery, a distance of 160 kilometres. The company finally came under the control of the royal Dutch group. The highest production in this field was reached in 1906, when 151,035 tons were obtained. In 1918 the production was 88,235 tons, but had increased to 104,376 tons in 1920. The field is described as being a long anticline, with petroliferous strata at depths varying from 100 to 600 metres. The specific gravity of the oil ranges from .780 to .807. Canadian and standard rigs were used, and over 200 wells were drilled, most of them producers.

The Babat field was also brought in by the same company. This area lies along the Moesi river, about 150 kilometres above the town of Palembang. It came into operation in 1901 with both flowing and pumping wells, the yield during the first year amounting to 3,730 tons, increasing to 70,690 tons in 1916, and decreasing to 59,475 ston in 1920. The oil is piped to the refinery at Pladjoe. The field is dome-shaped anticline, the oil-bearing strata being at a depth of from 25 to 200 metres. The specific gravity of the oil is .800. The machinery used in the development was largely Canadian.

The Ramok concession first came into production in 1910 with 152 tons, which had increased to 14,120 in 1920. The oil strata are

Lucy Rotary Well Driving Installation at Soengei Doea



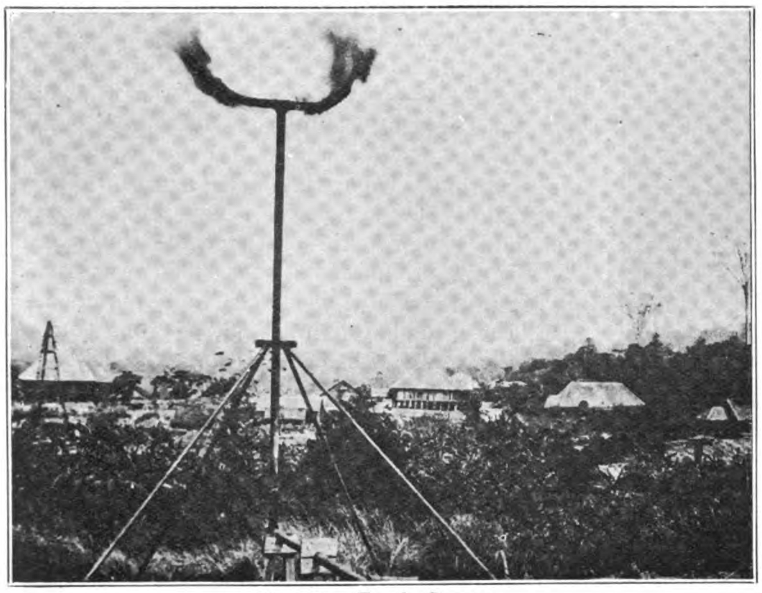
Petroleum Can Filling Apparatus at Pulau Brandan

much the same as in the Moeara Enim area. The specific gravity of the oil is .790, and the production is piped to the Bataafsche refinery at Pladjoe. Canadian machinery and standard rigs are used.

The Soeban Djerigi concession began production in 1905 with 23,266 tons, increasing to 133,695 tons in 1909, decreasing to 44,815 tons in 1914, and increasing to 66,103 tons in 1920. The oil-bearing strata vary from 100 to 500 metres in depth. The specific gravity is .770, and the oil is piped to the Bataafsche refinery at Pladjoe.

The Soeban Boeroeng concession first produced in 1914, when 340 tons were recovered. In 1920 the production was 53,329 tons. The specific gravity is .780 ; and the oil is piped to the Bataafsche refinery at Pladjoe. Canadian machinery and standard rigs were used.

THE JAVA FIELDS.—The most important producing fields in Java at the present time are Tinawoen, Panolan, Made, Djepon,



Burning Earth Gasses

and Twelve Dessas, named in the order of their 1920 production. They, are all situated in the residencies of Rembang and Soerabaja, in the eastern part of the island.

The Tinawoen concession consists of three producing fields on an anticline 1,500 metres long by 600 wide. There are five producing levels, varying from 60 to 340 metres below the surface. Up to 1917 some 184 wells had been drilled, of which 35 were producing in that year. The specific gravity of the oil is .870. The oil is piped to the refinery at Tjepoe, on the Solo river. The production in 1920 was 113,407 tons.

The Panolan concession has a dome-shaped anticline, about 1,800 metres long by 1,200 wide. There are seven producing levels, varying from 85 to 400 metres deep. Up to 1917 some 147 wells had been drilled, of which 90 were then producing. The production in 1900 was 23,536 tons, and in 1920 it had increased to 106,120 tons. The specific gravity of the oil is .850. The production is piped to the refinery at Tjepoe.

The Djepon concession's most important field is the Semanggi, the producing area of which is 1,500 metres long by about 600 wide. There are three producing levels, varying from 80 to 500 metres deep. Up to 1917 there had been 68 wells drilled, of which only four were still producing. The producion in 1900 amounted to 522 tons, which had increased to 25,899 tons in 1920, although over 40,000 tons were produced in 1917. The oil is piped to the refinery at Tjepoe. The specific gravity is .865.

The Made concession, in the residency of Soerabaja, produced 8,696 tons in 1905, 29,589 in 1919, and 31,758 in 1920. The oil is much heavier than the Sumatra product, varying from .830 to .890 specific gravity, and it is piped to the refinery at Wonokromo, near Soerabaja city.

The Twelve Dessas concession, also situated in the same residency, had a production in 1900 of 13,231 tons, 17,918 in 1918, and 19,031 in 1920. The oil is approximately of the same specific gravity as that of the Made concession, and is piped to the refinery at Wonokromo.

All of the above concessions and the two refineries are operated by the Dordtsche Petroleum Maatschappij, a subsidiary of the royal Dutch group. The N.I. Kolomiale Petroleum Mij., in which Americans are interested, have two producing concessions in the residency of Rembang-Petak, whieh produced 3,069 tons in 1920, and Tremboel, from which 562 tons were obtained in 1920.

THE DUTCH BORNEO FIELDS.—There are five important fields in this area, three of which are the largest producers of crude in this Colony—Louise, Tarakan 1., Tarakan II., Nonny, and Moeara—all operated by the Bataafsche Petroleum Maatschappij, a subsidiary of the royal Dutch company. The onere finery in this district is also owned by the Bataafsche, and is located at Balikpapan, on the east coast of Borneo. The Borneo oils are very heavy, varying in density according to the depth of the layers. The specific gravity of the top sand is .963, the middle sand .860 to .890, and lower sand .856. The Tarakan oils, however, are used for liquid fuel, and have a density of .980.

The Tarakan concessions are situated on the island of that name, off the east coast of Borneo. They came into production in 1906 with 8,065 tons, which has steadily increased until the two areas produced over 800,000 tons in 1920. The product is used almost exclusively for liquid fuel, the only process necessary for its direct use being a simple electric method for removing the slight amount of water which may be in the oil. The concessions are owned by the Tarakan Petroleum Maatschappij, and leased for operation to the Bataafsche Petroleum Maatschappij at a rate of fl.1.25 per ton.

The Louisa concession forms part of the Sanga Sanga anticline, the petroliferous strata being that described above, Between 200 and 300 wells have been drilled in this field, Canadian machinery and standard rigs being used. The production in 1916 amounted to 461,923 tons, 398,841 tons in 1917, 488,359 tons in 1919, and 454,387 tons in 1920, all of which is piped to the Bataafsche refinery at Balikpapan.

The Sanga Sanga Dalem field has an anticline some 90 kilometres in length, forming domes at two places.

The Noni (or Nonny) concession covers one of these domes at Sambodja, which produced, 1,180 tons in 1910, 198,199 tons in 1916, 152,559 tons in 1917, and 186,740 tons in 1920.

The Moeara concession covers an extension of the Sanga Sanga Dalem dome. Production was begun in 1902 with 1,366 tons, increasing to 77,595 tons in 1913, and 102,992 tons in 1920. It is operated by the Bataafsche on a royalty basis. Two new wells were brought into production on this concession during 1921, one with a capacity of 6,000 barrels per day and the other running 2,500 barrels daily.

Osaka to Have Model Public Market

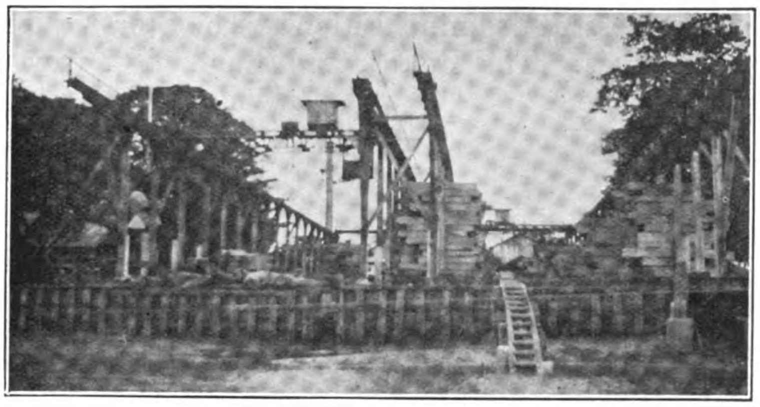
With a view to relieving the high cost of living in Osaka, the Osaka municipality intends to establish a large modern market, where all sorts of daily necessaries will be sold at the lowest possible prices. A ground covering about 15,000 *tsubo* has been allotted for the purpose in Sakura-nomiya and the ferro-concrete buildings will cover an area of over 6,000 *tsubo*.

The market will be equipped in a most up-to-date manner in all respects, while arrangements will be made for the quick transportation of goods to the market from different parts of the country, by the use of the present Joto Government Railway and also of a number of motor boats on the many canals of Osaka.

The municipality has already filed an application with the central government for the loan of Y. 2,800,000 at a specially low rate of interest, which will constitute part of the funds for the above market.

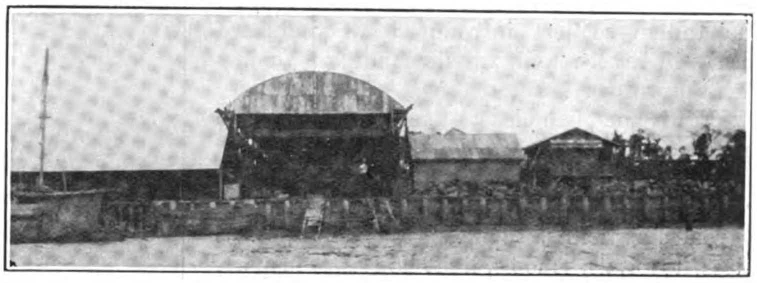
Teak Milling in Siam

BY far the greater part of the forest concessions in the teak forests of northern Siam are in the hands of five European firms: The East Asiatic Co., Ltd., The Borneo Co., Ltd., The Bombay-Burmah Trading Corporation, Ltd., The Anglo-Siam Corporation, Ltd., and Louis T. Leonowens, Ltd. Most of the smaller teak concessionaires sell their logs to the mills run by these companies at Bangkok, although a few, the most important among them being Wing Seng Long & Co., operate small mills of their own. Great commercial jealousy exists between the teak millers at Bangkok, and the mills on the Menam are closely guarded lest some trade secret be stolen by a competitor.



Most of the teak trees are felled in the vicinity of Chieng Mai, northern Siam, and 75 per cent. of the logs are floated on tributaries of the Menam, sometimes taking years to reach Bangkok. About 25 per cent. of the logs float into the River Salwin, which empties into the Bay of Bengal at Moulmein. The Siamese government maintains a station at the mouth of this Burma river, in order to collect tribute of logs felled in Siamese forests.

A new concession, said to be extremely rich in large teak trees, has recently been granted the Est Asiatique Francais at Chieng Rai, near the French frontier. As the forests are situated about the head water of the Mekong, logs felled here will be floated to Saigon for milling.



Saw Mill of the Bombay-Burmah Trading Corporation

The Siamese government has recently announced its intentions of raising the royalty on teak logs by 200 per cent. The present royalty varies with the size of the log, but approximates Tics 4 per log. Bangkok teak millers immediately entered a protest, and hope to compromise on a 100 per cent increase.

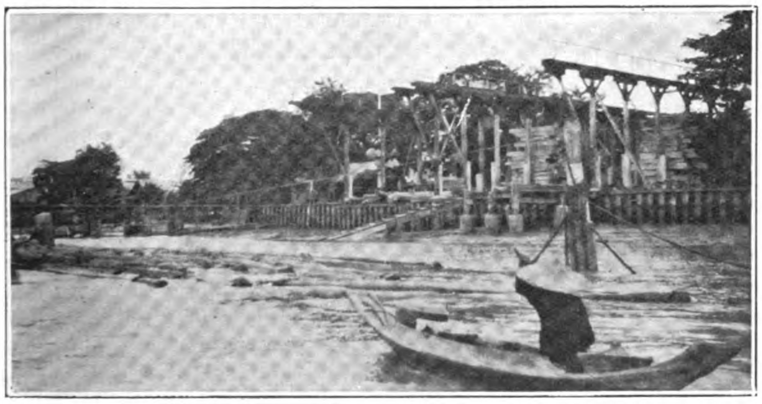
The milling of hardwood other than teak is done chiefly by the East Asiatic Co.'s mill at Bandon, and The Sriracha Co., Ltd., at Sriracha. The latter mill is considered one of the best equipped mills in the East.

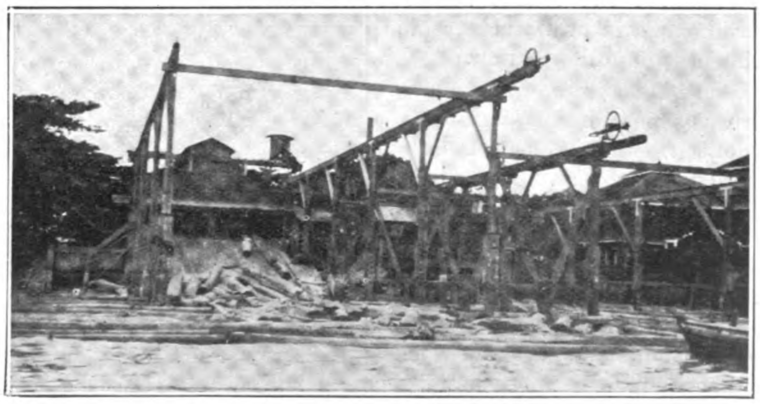
During the year ending March 31, 1921, sundry harwoods exported amounted to Tcs. 1,957,683 against Tcs. 12,339,720 worth of teak. The exports of teak for three years are tabulated as follows:

Year Ending March 31,	*1919*	*1920*	*1921*	*1922*
Quantity (tons) ..	36,931	70,202	71,617	
Value (ticals) ..	5,597,409	13,420,966	12,349,720	7,111,000

Thye Hong Seng-Saw Mill

Siam teak experts attribute the slump in the teak market partly to the Washington treaties, as battleship builders were large consumers of teak.





Teak Saw Mills of the Borneo Company at Bangkok

In the Land of the Roko

(THE FIJI ISLANDS)

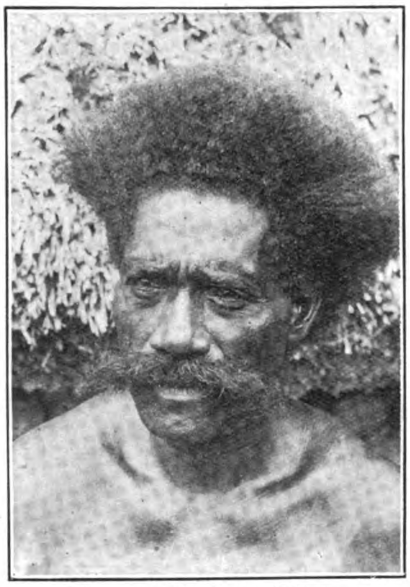
Successful Administration. The Story of Thakambau. Development and Industries. The Natives. The Rokos, and Nandis. Native Government. Kava. The Meke. The Leper Island of Makongai. The Indian Settlers.

By THOS. J. McMAHON, F.R.G.S.

THE British government has been most successful in its administration of the Fiji islands. Many administrators, supported by energetic officials, have done much in promoting progress. Undoubtedly a sane policy has been maintained giving every scope to commercial development, while thoroughly protecting the interests of the natives. Nevertheless, Fiji is to-day in the throes of many problems. The white settlers are seeking freedom from official government on dominion lines. The natives civilized and educated are bidding for employment equal to their progressive status. The Indian settlers introduced 48 years are openly in revolt, and are demanding equality with the whites.

Fiji is one of the least taxed portions of the British empire, its national debt is trifling, its revenues modest in amount. And yet no island group of the South Pacific is more up-to-date in roads, wireless, cables, telephones, post offices, hospitals, schools, light-houses, transport, and other public services.

The administration has excelled in the care of the natives. Fifty years ago the Fijians were savages and cannibals, to-day all are civilized and christianized.



Typical Head of a Fijian

Fiji consists of 250 islands, 90 of which are inhabited, the total area being 7,000 square miles. There are two large islands, Vitilevu, 4,000 square miles, and Vanua, levu, 2,500 square miles. The other islands are small, but every one has a wonderful commercial value.

Fiji holds a very central position in the South Pacific, it is about equal distance from Asia, America and Australia. Suva the capital, and a fine modern city, with a magnificent harbor is like to become the half-way house of South-sea shipping.

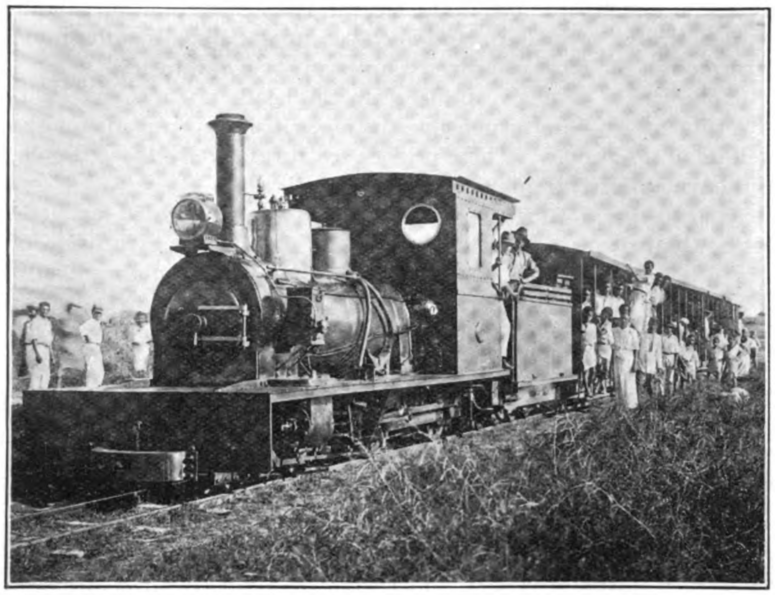
The islands of the group are remarkably mountainous, having an important bearing on the climate, which is wonderfully cool, and healthy, the death-rate is reckoned the lowest in the world. Malaria and other tropic ailments are quite unknown.

Fiji is fast gaining a reputation as a paradise of the tourist. Mountain and river scenery particularly grand. The riding of the rapids at the heads of rivers, and in frail canoes expertly managed by natives is a thrilling experience. The natives are a picturesque race of agreeable manners, their customs and ceremonies are especially attractive.

In the Sugar Field of Navua, Fiji Islands

The name of Thakambau is ineffecably written on the traditions of Fiji. In the chief city, the European settlements and the native towns there are numerous Thakambau streets, avenues, houses and institutions. Half a century ago Thakambau ruled Fiji, his name and deeds were respected throughout the South seas. He was a man of majestic figure, and most impressive commanding personality. From a mere chief of a small island and tribe, with an army of giants like himself he conquered the whole of Fiji, and set out to conquer the island groups of the South Pacific. This he did not accomplish but he succeeded in making the Fiji islands the most progressive of the South seas. He encouraged the settlement of the whiteman, and favored every kind of enterprise, but no monarch was so autocratic; he would suffer no interference with his authority. The commercial progress of the South sea kingdom brought to the king liberal revenues. Thakambau was an extravagant monarch, he delighted in rich foods, many palaces, grand furniture and splendid dress. On public occasions he would appear in a purple robe and a massive gold crown. But a day came when the revenues declined, and then serious differences arose with his subjects, culminating with an open quarrel with the American consul. The consul accused the king of inciting his native people to seize American traders' property. Thakambau denied the accussation, and the natives rose to support their king. In the midst of the hubbub the consul's house was burnt down, the consul demanded 40,000 dollars in reparation. The American home government eventually interfered, and sent a war vessel to enforce the consul's claim. Thakambu invited the British government to protect him and his people, this was refused. For some months it looked as if the Fiji islands were to pass to American ownership, when relief came to the king in two forms. A rich Australian trader paid the 40,000 dollars, and the British government after repeated petitions from the king decided to take over the Fiji islands. The first British administration was set up in 1874, and King Thakambau retired on a liberal pension to the royal island of Bau.

Development since British administration has been energetic. Travelling through the islands it is impressive to witness the variety of traffic, the stretches of settlements of whites, Fijians and Indians, the

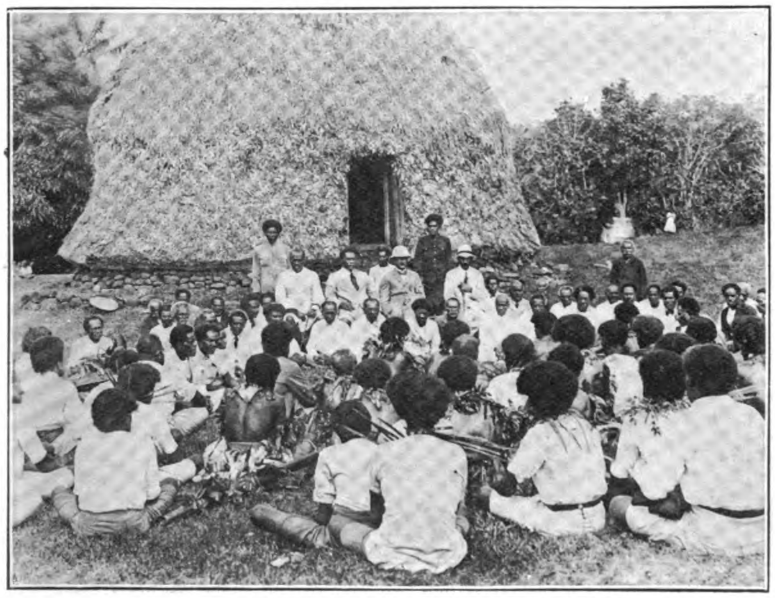


A Fiji Islands Railway Train

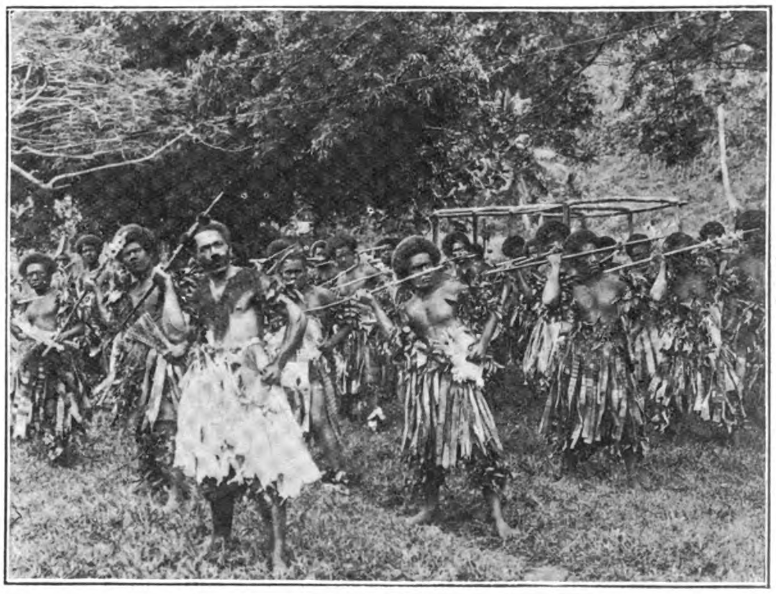
Lautoka the Headquarters of the Sugar Industry of the Fiji Islands

Fijian Police on March, Fiji Islands

The Broadway of Suva the Capital of the Fiji Islands



A Native Parliament, Fiji Islands



A "Meke" or National Dance, Fiji Islands

vast areas of sugar cane, the number of sugar mills, the hundreds of miles of light railways, the fine steel bridges over the great rivers.

The trade of the group is estimated at six millions sterling annually. The products are sugar, coconut, bananas and cattle. The cultivation, milling and export of sugar is the main industry, and is on a vast scale, managed on most modern conditions. The cultivation of the banana is interesting. This fruit was introduced but it instantly took on such a wonderfully rich flavor that ever since it has been termed the " Fiji " banana. Banana plantations are owned by whites, Indians, Chinese and Fijians, and altogether cover many thousands of acres. Up to twelve months ago the chief export was to Australia, but a tax upon the export, in order to protect Australian banana growers abruptly ended the trade. This was promptly taken up by New Zealand and America. Not only are bunches of bananas exported but there is a rapidily increasing trade in preserved bananas and banana flour.

In a Fiji Banana Plantation

Whole islands are given up to the cultivation of the coconut, and many thousands of tons of copra are exported every year, the planters being exceedingly wealthy.

Small as is the extent of Fiji it has some of the richest pasture lands of the Southern Hemisphere. Cattle and sheep do well. A big meat works is being erected, and dairying is being carried on most successfully.

The natives of Fiji have a race individuality, and so many superior characteristics that they are certainly one of the most outstanding native peoples of the South seas. The common folk are possessed of a natural politeness, and dignity ; the chiefs of a refinement which is unmistakable. There are 85,000 Fijians, a clean, wholesome people. Most are employed in native industries, the tilling of their gardens, many of the men owning banana, coconut and sugar planations, or work for the white men on theirs. Several Fijians hold responsible administrative positions, such as police, many are clerks in business establishments, and many are employed by the government and missions as teachers in schools. The Fijians while loyal to the British administration have a faithful reverence for their own Fijian royal family. The present representative is the Ratu Popee, a grandson of Thakambau, most cultured gentleman. Popee lives on the island of Bau in a large native "Bure" or palace, and receives guests in a drawing room furnished in the most approved European style and taste.

The Rokos or native princes are the heads of the native self-government, and are responsible to the British government for the welfare of the people. These princes are always well educated men, and have a powerful influence with the natives.

Up to recent time the women of Fiji were regarded as little better than slaves. It is a very evident sign of the civilization of the Fijians that the women are now accepted as equals. The Nandis or princesses have done much for the upliftment of the women. The Fijian woman no longer lives in neglect, she beautifies her home, dresses well in European fashion, and cares for her children in a very sensible manner.

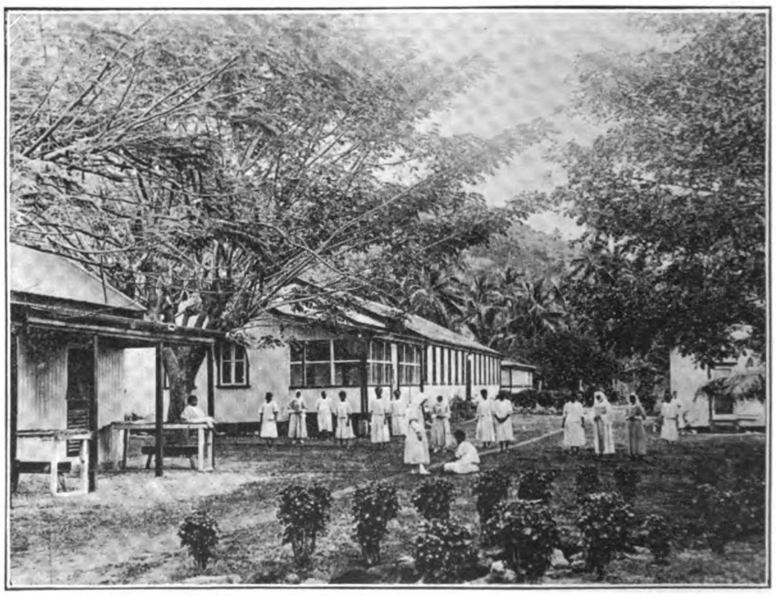
Many Fijian customs are dying out, the younger generation are throwing off the yolk of the unprogressive custom of communism. The general ownership of wealth, food, clothing and effort is not consistent with progress, and the young Fijian is out for personal prosperity, much to the annoyance of the old men and women.

Native towns are very modern in many respects, they are laid out with streets, have water supplies and sanitation is enforced. The chief of a town is called a " Mayor," and there is a kind of municipal government which stands for progress.

The islands inhabited in the Fiji group are divided into provinces, districts and towns, and this for the interesting self-government of the natives. A Roko rules a province, a " Buli " or minor chief a district, and a " mayor " a town. The people of a town send representatives to the municipal council, this council sends representatives to the district councils, and then finally the districts send one or more representative according to population to the native parliament of the province.

A parliament is held once a year in some big town of a province, and is an imposing affair attracting thousands of natives—men, women and children, when after the closing of the parliament

The Making of Tappa or Native Cloth by Women, Fiji Islands


The Women's Quarters of the Leper Island of Makongai Island, Fiji Islands

there are great festivities for several days and nights.

A Fiji parliament is not unlike any other parliament, there is a chairman and clerk, there is much discussion on the matters of roads, schools, hospitals, taxes and the native health, the deliberations being forwarded to the British governor of Fiji who approves or disapproves as he thinks fit. The opening ceremony of a parliament is carried out with wonderful ceremonies. There is much drinking of "kava," most elaborate native dressing in tappa or native cloth, leaves, and flowers, there is much native singing, and speechifying.

No ceremony is complete in Fiji without the drinking of "kava," the native grog. This compounded from a shrub called "Yangona." The roost are crushed and mixed with water and frequently strained through a thick fibre cloth. It has a yellow-green appearance, and no particular taste. The natives drink it excessively, and many white people, long residents in the group, commend it for its medicinal qualities. In presenting a cup of "kava" a Fijian kneels and while the drink is being swallowed vigorously claps hands. An empty cup is never returned but is sent spinning into the middle of a room, the more it spins the more it shows appreciation of the compliment of being offered the drink. To be offered a cup of "kava" by a Fijian woman is the highest compliment that can be paid by Fijians.

As "kava" is the national drink, so the "Meke" is the national dance or entertainment of the Fijians. A "Meke" may be described as a legend told in song and dance. It might be of some famous tribal battle of the olden days. Hundreds of handsome young natives robbed in the most gorgeous manner take part, holding either spears or clubs, go through, with wonderful agility, grace and precision, the movements or actions of battle, and which may last for an hour or more. Women supply vocal music, by no means tuneful, but in which time is well marked.

Among the islands of the Fiji group is one of rare beauty, possessed of a remarkably healthy and untropic climate, and is known as Makongai. Here is a leper establishment where all the lepers white, yellow and black are gathered from all British South sea islands. The island is laid out in lovely gardens, and the lepers are treated in the most scientific and humane manner. Cures are frequent, and so rapidily and thoroughly is the disease of leprosy being stamped out that it is estimated in another ten years there will be no lepers in the South seas, or at least in the islands under the British.

There are in Fiji 61,000 Indians, and the number is increasing, and despite the fact they are a discontented, unhappy people. It is difficult to understand the causes of their discontent, poverty among them is quite unknown and even impossible. How prosperous they are the following details will plainly disclose:—

Some of the richest men of Fiji are Indians. In every Indian settlement are scores of Indian storekeepers, tradesmen all doing well, sharing the earnings of the Indian workers of the sugar and banana industries. An interesting evidence of Indian wealth is the quantities of jewelery worn by the women, children and often the men. It is quite common to see women weighted down with jewelery worth hundreds of pounds. The popular fashion is a necklet of Australian sovereigns, 25 and more a necklet. Tiny children can be seen playing in gutters wearing these necklets of 10 to 12 sovereigns. Every Indian owns either a motor car or a horse sulky. The owners of racehorses are mostly Indian young men.

The following particulars should prove interesting. In five vessels leaving Fiji in 1920 for India carrying only Indian passengers visiting their homeland, there traveled 4,751 adults, 1,906 children, having remittances equal to £196,389, jewelery valued at £31,891, and cash in hand equal to £8,054.

The details furnish the best evidence of the condition of the Indians in Fiji. They give the lie to the reports scattered world wide that the Indians of Fiji were, and are, little better than slaves, and that they were being exploited by the white settlers particularly the sugar companies. The Indians, it is significant while agitating against the whites and their enterprises, openly profess they will never be contented until the British government hands over to them the administration of the Fiji islands. The Fijian natives detest the Indians and are agitating that they be dismissed from the islands. With the future hol ds for Fiji is at present doubtful. The Indians are the only obstable to progress, with this obstacle overcome Fiji has a very bright and wonderful commercial future.

Municipal Improvements in Swabue

In December, 1921, the civil governor of Kwantung province directed the transformation of the old Chinese city of Swabue into a modern municipality, and appointed a returned American student (Mr. K. Y. Chan) as chief engineer of the public works department of the city. Work was begun in January, 1922, upon the construction of a 60-foot street running north and south, parallel with the water front, 4,000 feet in length. Another street of similar width, 5,000 feet in length, was begun on April 1. Three other streets are to be constructed.

Two public gardens have been laid out in modern style, with cement walks, fountains, and flower beds, advantage having been taken of all the natural beauties of the site.

Additional plans call for the construction of a wharf at the water front of Swabue, a market place, and a highway bridge (all of concrete) when financial conditions permit.

The city of Swabue is located on the South China coast about midway between Hongkong and Swatow, and is the principal small seaport between these two cities. It has an excellent landlocked harbor, which, however, will only accommodate vessels of shallow draft.

The topographic survey of a highway running north from Swabue to Haifeng city (a distance of about 15 miles) has just been completed. This highway will connect at Haifeng with the Canton-Chaochow highway and will afford a means of rapid and easy communication with both Canton and Swatow. The highway will be built at least 30 feet wide, and will be of modern construction in every respect.

The construction of the streets and highway referred to will be accomplished principally by the use of coolie labor, which is cheap, rather than by the purchase and use of machinery, which is comparatively expensive; but a steam road roller, weighing about 10 tons, will be used on both city streets and country highways, since it s impossible to operate by hand a roller of the weight required. Materials for building the streets and highway are found in abundance in the vicinity of Swabue.

NAGASAKI HARBOR IMPROVEMENT

Nagasaki's new Y.1,500,000 quay is nearing completion and will soon offer better facilities to ships calling at the port. At present cargo and passengers are handled by means of barges and tenders, but the new quay will enable two steamers of 8,000 tons each or of three of 5,000 tons each to anchor along the quay at one time. The frontage is 220 *ken* or a little more than 1,388 feet.

The cost of the quay is being borne by the city, although approximately one-third of the wharf frontage is for the exclusive use of the N.Y.K. for its Shanghai steamers. The depth of water alongside the quay is 30 feet. The widest part, at the extreme left, measures 230 feet. The part, for the use of the Nagasaki-Shanghai service boats, is to be completed sufficiently for the use of the ships by December. The accessory buildings, waiting rooms, ticket office, and baggage rooms are to be completed in February.

The ultimate plan, the completion of which require several years, is to extend this quay as far as the railroad station. The trackage will come alongside to make connections with the Shanghai boats.

Electrical Development in Japan

1. ELECTRIFICATION OF THE IMPERIAL JAPANESE RAILWAYS

By. H. C. Huggins

THE first Japanese steam railway to be electrified was the Kubo Railway Company's line between Nakano, in the suburbs of Tokyo, and Shohei Bashi, in Tokyo city, in 1905, before the line was nationalized. The first electrification project to engage the attention of the national railways was on the line between Yokogawa and Karuizawa, where the slope is 1/15, and in a distance of 6.9 miles there are 26 tunnels. The actual construction of this electric line was begun in April, 1910, and was completed in September 1911. Owing to many imperfections in equipment and minor mishaps during the first months of experimental operation, the completed electric line was not opened to passenger and freight traffic until May 1912.

Karuizawa is the most suitable location in Japan for a healthy; vigor-renewing summer resort. But the difficulties of the railway journey had retarded the growth of the summer community. With the electrification of this line the number of persons traveling to Karuizawa every summer has increased year after year, and the results of the electrification have always been an argument for the complete electrification of the Imperial Government Railways. Before the electrification of this line over the Usui Pass, the speed of trains was six miles an hour, and during 24 hours only 36 round trips were possible. At the present time, the average speed of electric trains is 11 miles an hour, and the average number of round trips a day is 44 ; in case of need 70 trips can be made. The transportation capacity of the line has been doubled. These results are not remarkable, but failure to achieve better results is entirely due to the poor selection of locomotives, and the inefficiencies of the locomotive engineers. The electrification, however, has proved financially most profitable.

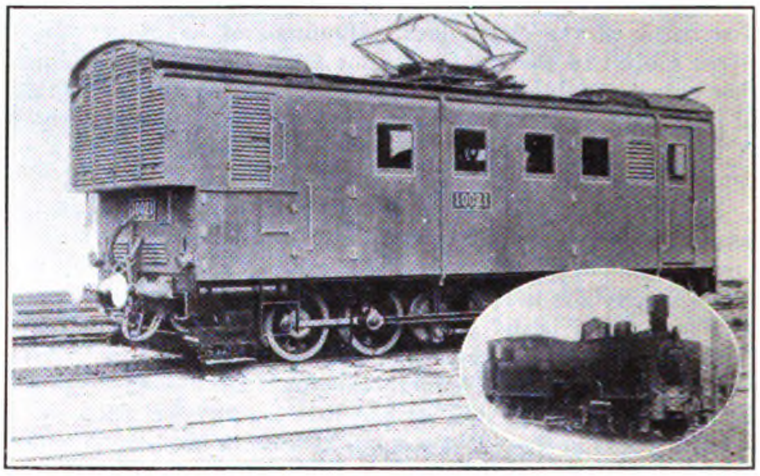
The cost of this electrification of the Usui Pass line was extremely high, despite the low prices of materials in 1910. Including the construction costs of power plants, transformer stations, wiring, exclusive of the costs of the locomotives, the total cost of the electrification of these 6.9 miles amounted to Y.1,900,000, about Y.270,000 a mile. This high cost astonished the public, and deterred further attempts to introduce electrification on other lines.

At the time of the electrification of the Usui Pass line the government of the day, the Katsura cabinet, had an ambitious, plan to double-track the entire line between Tokyo and Shimonoseki, changing the gauge of the track from 3-ft. 6-in. to standard gauge, 4-ft. 8½-in. Electrification had not yet begun to impress the public and the politicians as the most profitable advance the nation could make toward the solution of transportation problems. For six years each successive cabinet found itself confronted with the "wide-gauge" problem, and electrification as a policy was practically unknown.

With the organization of the Hara cabinet, the "wide-gauge" policy was definitely abandoned, and the question of electrification as the national policy for improvement of transportation on the government railways again came to the fore as a question of the day.

The first expression of the importance of the question came in a government bill presented to the 43rd session of the national Diet (1919-1920), providing for a semi-governmental corporation to prepare the power equipment which would be needed by the electrification of all the railways. The scheme was grandiose, and was violently opposed by the house of peers. Opposition was so rabid that the bill was hurriedly withdrawn, and the flurried government hastily proposed a plan for the establishment of an electric bureau attached to the department of railways, which would undertake a national survey for electrification, to be carried out eventually by the government railways themselves, without the assistance of private capital.

An Electrically Hauled Train



An Electric Locomotive (inset, its predecessor)

One of the first projects approved in connection with the eventual electrification of all the national lines was the Shinano River power plant, to be built to generate 65,000 kilowatts, for transmission from the North-Eastern district to the Tokaido. The 44th session of the imperial diet approved this plan and the estimates of cost (1920-1921). Later, it was thought advisable to increase the estimates, and this change also met the approval of the diet.

The department of railways now operates three electric power houses, at Yaguchi, Yokogawa and Akabane. The hydro-electric super-power house which is to be built on the Shinano River will be the fourth plant under the department's control. The maximum water head at this power plant will be 3,000 cubic feet per second, and the power yield will be approximately 116,000 h.p. theoretically. This will be the greatest power house in Japan.

The survey of the dam site has been completed, and a light railway for transporting materials for construction has been built

to the dam site from the nearest railway station. Work on this power plant will be completed by March 31, 1927. The power generated will all be transmitted to the Tokyo district, to meet the demands for power which will be made by the electrified railway lines. Until this plant is in active operation the demand for power on the Tokaido between Odawara and Tokyo cannot be met from existing government power plants. The source of power for the new electric section is therefore being thoroughly investigated at the present time. As the line between Odawara and Numadzu through Atami is to be completed by March 31, 1926, the need for power in this section is likely to become acute before the Shinano project is completed.

The first general plan for electrification was also presented to the next session of the diet (45th—1921-1922), the "First Period Project" provides for the electrification of the following ten lines :—

1. Tokyo-Odawara
2. Ofuna-Yokosuka
3. Nakano-Kokubunji
4. Ueno-Omiya
5. Ryogokubashi-Chiba
6. Tokyo-Uyeno
7. Manseibashi-Ryogoku Bashi
8. Kokubunji-Hachioji
9. Kozu-Numadzu

(These nine lines are all in the Tokyo district).

10. Minato Machi-Shijo Nawate-in Osaka.

The first of these lines to be electrified will be those east of Kofu, the Ofuna-Yokosuka line, and the Yokohama-Odawara line, the section between Tokyo and Yokohama along the main Tokaido line having already been electrified, in part. These two lines will be completed in 1923-1924. The tunnel through the Hakone mountains now being built near the town of Atami will be completed in 1924, and the line between Odawara and Numadzu, passing through this tunnel will at once be electrified. This work will be completed in 1925-1926. So that by 1926 the whole main line of traffic between Tokyo and Numadzu on the Tokaido line will be completely electrified.

The complete electrification of the Tokaido line between Tokyo and Kobe is a pet project of the department of railways. The electrification investigating committee has prepared a plan which will be presented at the coming session of the imperial diet, if the approval of the department of finance is first obtained.

The expenditures which have been approved for electrification amount to Y.76,561,000 in all, to be used between 1921 and 1929. The present allotments of funds are as follows :

Expenses of Electrification.

	1921	1922
Vicinity of Tokyo	Y.1,238,000	Y.1,304,000
Yokohama-Yokosuka and Odawara..	902,000	902,000
Uyeno-Omiya	265,000	264,000
Yokogawa-Karuizawa..	236,000	236,000
Tokyo-Uyeno	218,000	439,000
Osaka, Minato-machi, Kata-machi, Shijo Nawate	————	236,000
Light and power equipment	492,000	443,000
Communication and signal equipment	2,710,000	2,641,000
Power plants and transformer stations	5,668,000	6,071,000
Total	Y.11,897,000	Y.12,523,000

It is reported that the complete electrification of the Tokaido line alone will cost Y.67,000,000. If the plan of the electrification investigating committee is approved, construction will be begun in 1923, and completed in 1929.

The electrification of the Tokaido line will be a comparatively simple task, once the question of power supply is settled. To equip the present track for electric traffic it is only necessary to provide the wire equipment. It is intended to use a direct current at 1,500 volts highest pressure. The third rail will be employed in tunnels. Accordingly the expense for construction is very light, but the costs of power plants, transformer stations, carriages and locomotives are exceedingly great.

To complete the Tokyo-Yokosuka (in reality only Yokohama-Yokosuka, and Ofuna-Odawara, sections, which are to be opened to business during the 1923-1924 fiscal year, the following sums have been allotted :—

Electrification Costs for Tokyo-Yokosuka, and Ofuna-Odawara Line

Equipment	1922	1923
Electrification	Y.3,683,000	Y.589,000
Carriages and Locomotives ..	3,140,000	6,866,000
Shops	100,000	—
Total	Y.14,378,000	

The cost of carriages and locomotives is 70 per cent. of the estimates, about Y.10,000,000. According to the estimates of the electrification investigating committee 52 per cent., or Y.35,000,000 of the Y.67,000,000 estimated as the total cost of electrifying the Tokaido line between Tokyo and Kobe, will be required for locomotives and carriages. The kinds of locomotives which will be required are :

Use	Number of Locomotives	Equipment
Special express trains	9	8—250 h.p. motors
Ordinary express trains	46	6—250 h.p. motors
Local passenger and freight trains, and for switching	236	4—250 h.p. motors

Excluding the costs of carriages and locomotives the expense of electrification per mile amounts to only Y.86,000. The construction of power plants is not included in this estimate, but the costs of transformer stations are. The carriage and locomotive equipment costs are proportionately large, but as the estimated costs for improving present steam locomotive equipment on the Tokaido line may be transferred to the electrification account, the added charges on the budget are not prohibitive. It is therefore believed in the railway department that the actual cost of the entire change to electricity on the Tokaido line will fall below the Y.67,000,000 the committee has estimated.

The distance between Tokyo and Kobe on the Tokaido line is 373 miles. As the costs of electrification and rolling stock have already been budgeted for the Tokyo-Yokosuka, Ofuna-Odawara sections, the expenditure still to be approved by the coming diet is reported to be not more than Y.26,000,000.

By the electrification of the Tokaido, and later other national lines, the department of railways expects to make great and sweeping reductions in the costs of operation. The high cost of passenger traffic is the target of much attack just at this time, and a lower passenger fare is expected as one of the results of the electrifications.

Comparing the speed of electric and steam locomotives from 50 to 75 per cent. in time is saved in running passenger trains, and 20 to 46 per cent. in freight train traffic by the use of electric trains. On slopes of 1/40 or steeper, the loads of steam trains must be decreased at least 60 per cent. At present express trains on the Tokaido are pulled over the Hakone mountains by two locomotives at a speed of 15 to 16 miles an hour, carrying a load of 350 tons. This is far below the normal speed and load. With electric locomotives it will be possible to haul 420 tons at a speed of 30 to 35 miles an hour. These figures are normals, but the curvature of the track, and other engineering disadvantages may materially reduce these speeds and hauling capacities. At least the time of transit will be greatly shortened, and this will enable the railway department to operate more trains on the present trackage.

The present traffic on the Tokaido main line, which is double-track between Tokyo and Kobe, is 44 trains a day in each direction. The number of passenger trains is somewhat limited by the hours of day-time traffic, but there is no time limit to the increase in the number of freight trains which can be operated.

The department of railways has estimated the saving which can be effected by the electrification of the railways as shown in the following table :—

COMPARISON OF COST OF POWER ACCORDING TO VARIATIONS IN THE PRICE OF COAL

Price of Coal per ton.	Water power 2 sen per kilowatt hour (Index)	Coal Burning Electric Power per kilowatt hour (Index)	Steam Locomotives per kilowatt equivalent (Index)
Y.5.00	1	1.00	0.74
Y.10.00	1	1.24	1.12
Y.15.00	1	1.60	1.60
Y.20.00	1	1.80	2.00
Y.25.00	1	2.08	2.40
Y.30	1	2.40	2.90
Y.40.00	1	2.90	3.85

(Price of coal, estimated per long ton. Other figures based on (1) as business expense of using water power at 2 sen per kilowatt. Business expenses include interest on construction costs. Table compiled by Mr. Yoshiwara, of the railway department.)

It is obvious that steam power is much more economical than electric power when coal is Y.5.00 a ton. But when the cost of coal rises to Y.10.00 a ton, the expenses of hydro-electric power is about 8 per cent. less than burning coal. With coal at Y.15.00 a ton, the use of hydro-electric power effects a saving of 60 per cent. Estimating coal at Y.13.00 a ton, approximately its present price, the saving effected by using hydro-electric power, is something like 30 per cent. With hydro-electric power at 2.5 sen a kilowatt, there is still a saving of 20 per cent. with coal at its present price. It is estimated that the total amount of coal saved after the entire Tokaido line is electrified, will reach 500,000 tons a year. This will have a most interesting effect upon the whole of Japan's industrial world. But it is doubtful if the coal miners will be so greatly pleased.

The greatest advantage of the electrification from the point of saving will be in the emancipation of the railway department from the fluctuations of profit caused by the ever changing prices of coal. Operating expenses are also greatly decreased, the number of employees required for the efficient operation of electric trains being much less than is needed by a steam train.

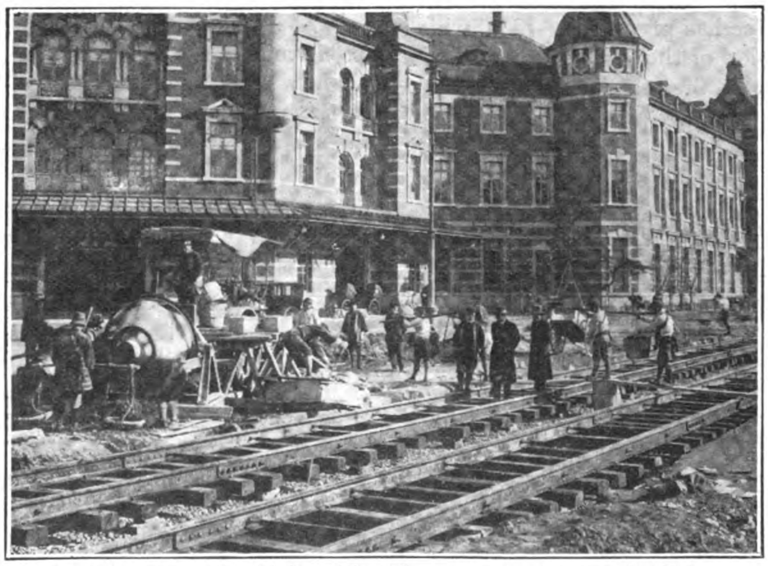
It is doubted in some circles, whether the coming diet will approve the plans and estimates for the complete electrification of the Tokaido line, as the policy of the present cabinet, decidedly tends towards economy. But in view of the fact that the electrifications are to be effected from the operating funds of the railway department, not from the general budget there seems no legitimate reason for objecting to the plan as a whole, provided the plan from an engineering standpoint has been reasonably estimated.

With the complete electrification of the Tokaido line the Imperial Japanese railways will have one of the finest railway lines in the world under its operation. Not only from the point of equipment will the line be almost ideal, but there is hardly a railway in the whole world with such wonderful scenic attractions, as the Tokaido on the sections between Kozu and Numadzu, as Numadzn as Shizuoka, and Hamamatsu to Toyohashi.

2. TOKYO CITY'S TRAMWAYS

The surface electric lines in Tokyo city were municipalized in August, 1911. Before that time they were operated by a private company which in turn was a merger of three different systems.

The first public transportation line in Tokyo was built in 1882 by the Tokyo Horse Tramway Co., between Shimbashi and Nihonbashi, through the main part of the business section of the city. Later the same company laid lines between Uyeno and Asakusa and between Asakusa and Shimbashi. In 1897, the Shinagawa Horse Car Railway Co., Ltd. built a line between Shinagawa and Shimbashi and two years later amalgamated with the Tokyo Horse Tramway Co. The merger operated 20 miles of lines, and owned 300 cars, and 2,000 horses. Traffic grew heavier with each improvement in service, and extension of line. The horse cars proved unable to handle the traffic and it was determined to electrify the lines. The company then changed its name to Tokyo Densha Tetsudo Kaisha (Tokyo Electric Tramway Co.), and relaid the track between Shinagawa and Shimbashi. In August, 1903 it was reopened as an electric line.



Track Work on the Tokyo City Tramways in front of the Tokyo Central Station

Many new companies sprang up about this time planning to engage in electric transportation. The Tokyo Denki Tetsudo Kaisha (Tokyo Electric Railway Company) and the Tokyo Shigai Tetsudo Kaisha (Tokyo City and Suburban Railway Co.) were organized and laid new lines. The three companies actively engaged in competing for public support.

During the Russo-Japanese war it became difficult to obtain funds for private enterprises, and at the same time the number of passengers decreased. There was much discussion of a uniform fare for all lines. In September 1906 accordingly, the three companies decided to merge their interests under the name of the Tokyo Tetsudo Kabushiki Kaisha (Tokyo Railway Co., Ltd.)

At the time of the amalgamation there were 89.5 miles of track in Tokyo city, on which 919 cars, including 9 bogie type, were operated. The average number of cars run daily was 642, and the average number of passengers carried was 320,749, yielding an income of Y.10,286, a day.

After the successful outcome of the movement to nationalize the railways an agitation to municipalize the tramways was started by interested persons. Negotiations with the municipality continued for two years and in 1911, the Tokyo Tetsudo K.K., with all its railway, light and power business became the property of the municipality, together with all its rights to construct new lines along routes already approved by the central government. At the time of the purchase the company owned 119.5 miles of track, and operated 1,054 cars. The average number of passengers carried daily in June and July 1911, was 533,456, and the average daily income for the same months was Y.18,468.53.

After the municipalization, the city established the "Electric Bureau" to take charge of the new enterprises. This bureau at once

TOKYO CITY TRAMWAYS

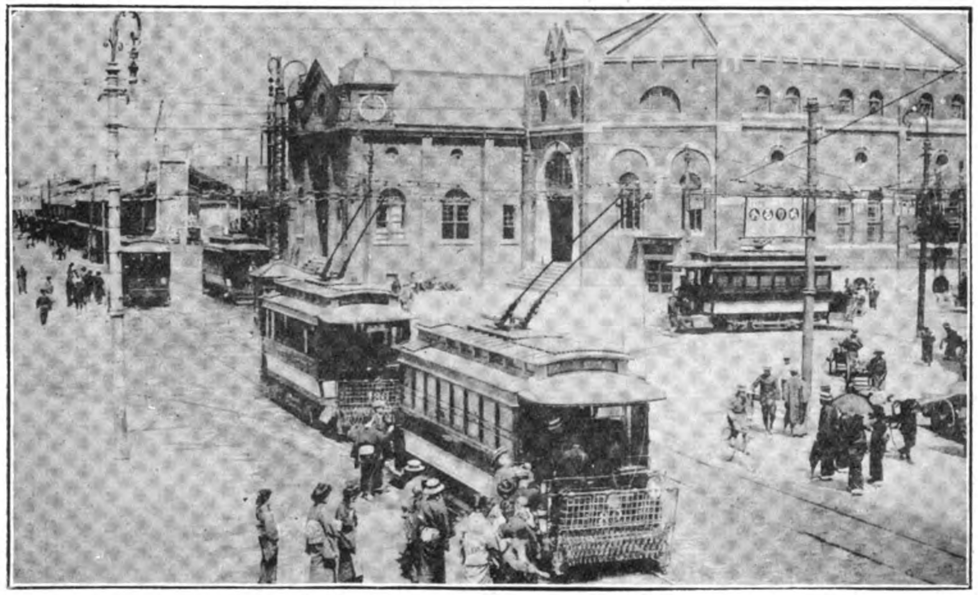
Nearly 500,000,000 passengers were carried in 1921 by the Tokyo Municipal Tramways, a daily average of 1,450,231, providing a gross income of Yen 29,766,901. A total of 1,721 cars are operated on 184 miles of track. In order to meet the pressing transportation needs of the capital, work is now being pushed on 54 miles of new double track. When completed, the number of cars in operation will be 2,050.

NIHONBASHI (THE BRIDGE OF JAPAN)—THE HEART OF TOKYO

View of the Ginza, looking South from the Bridge

Looking North from the Nihonbashi

Crowds Awaiting Transportation at Nigiwai Suda Street, Tokyo



A Busy Tramway Corner in Tokyo

began active building of the 110 miles of lines which were licensed for construction.

The number of trams in operation was also increased, and many re-adjustments of lines and services were made to increase the efficiency of the system.

A careful adjustment of service gave a great impetus to the movement of population within the city, and to the outlying districts. As these suburban districts have grown by the aid of good transportation service, the business of the railways has become increasingly prosperous.

However, because of the financial depression which began with the outset of the European war, and the consequent rise of prices in Japan, business expenses of the city railways have been greatly increased. In June 1916 the fare was raised to 8 sen for a single trip, and 15 sen for a return trip. At the same time the labor question began to effect the employees of the electric bureau, and many improvements in their condition were inaugurated by using the increase of income which was obtained from the raise in fares.

Mr. Hambei Nagao,
President of the Tokyo City Electric Bureau.

Mr. Chikatami Soyama,
Engineer-in-Chief of the Tokyo City Tramways.

The total income of the tramways in 1921 was Y.29,786,901. Expenditure was Y.44,902,624. The number of passengers carried was 448,408,087. The deficiency in income was met by transfers of funds from other accounts, and by bond issues, and the great expenditure was incurred in order to increase the operating lines in the city.

At the end of May 1922, the bureau controlled 183.857 miles of track, and operated 926 bogie cars, 795 small type cars, 1,721 cars in all. The daily average of passengers carried was 1,450,231 for the year, and income was Y.95,935.90. The number of cars operated daily averaged 1,427, and the number of miles run a day was 130,570. The number of employees on the cars and tracks was 11,055.

Mr. Tsutomu Saito,
Director of the Tokyo Municipal Council, Electric Section.

Mr. Genryo Masuda,
Director of the Tokyo Municipal Council, and Electric Section. Former Engineer-in-Chief who designed the present tramway system.

The city of Tokyo has invested in its electric railways Y.105,910,000. The city to cover the costs of the railways up to the end of June, 1922, has issued bonds as follows :

1912 : *Municipal Ordinance Nos. 2 and 3.*

Bonds for Electric Enterprises.

Issued in	Amount Issued	Amount Redeemed
Great Britain ..	£3,175,000 }	£590,700
United States ..	2,000,000 }	
France	Frc. 100,880,000	Frc. 8,177,500

Amount Outstanding.

Great Britain and U.S.A. Issues £4,584,300
France .. .. Frc. 92,702,500

Issue price : G. B. and U. S. A. £93 and £93½.
France .. .. Frc. 92

Annual Interest : 5 per cent.

Interest Paid : March and September ; Term of redemption.
To begin : September, 1916.
To be completed : March, 1953.

1914 : *Municipal Notification No. 2.*

Second Issue Electric Enterprise Bonds.

" I "

Issued in Japan to the amount of Y.10,000,000.

Y.533,500 has been redeemed leaving Y.9,466,500 outstanding.

The yield on issue was Y.93.50.

Interest: 5 per cent., payable in June and December.

Redemption began December, 1921, and will be completed by November, 1937.

" Ro."

Issued in Japan to the amount of Y. 5,000,000.

The yield on issue was Y.90.00.

Interest: 5.5 per cent., payable in March and September.

Redemption began April 1922, and will be completed in May 1954.

1920 : *Municipal Notification No. 68.*

Short Term Bonds for Electric Enterprises.

Issued in Japan to the amount of Y.10,000,000.

The yield on issue was Y.94.00.

Interest : 6 per cent., payable in May and November.

Redemption began May, 1921, and will be completed in May, 1925.

1921 : *Municipal Notification No. 61.*

Second Issue, Short Term Bonds for Electric Enterprises.

Issued in Japan to the amount of Y.15,000,000.

The yield on issue was Y.93.00.

Interest : 6 per cent., payable in May and November.

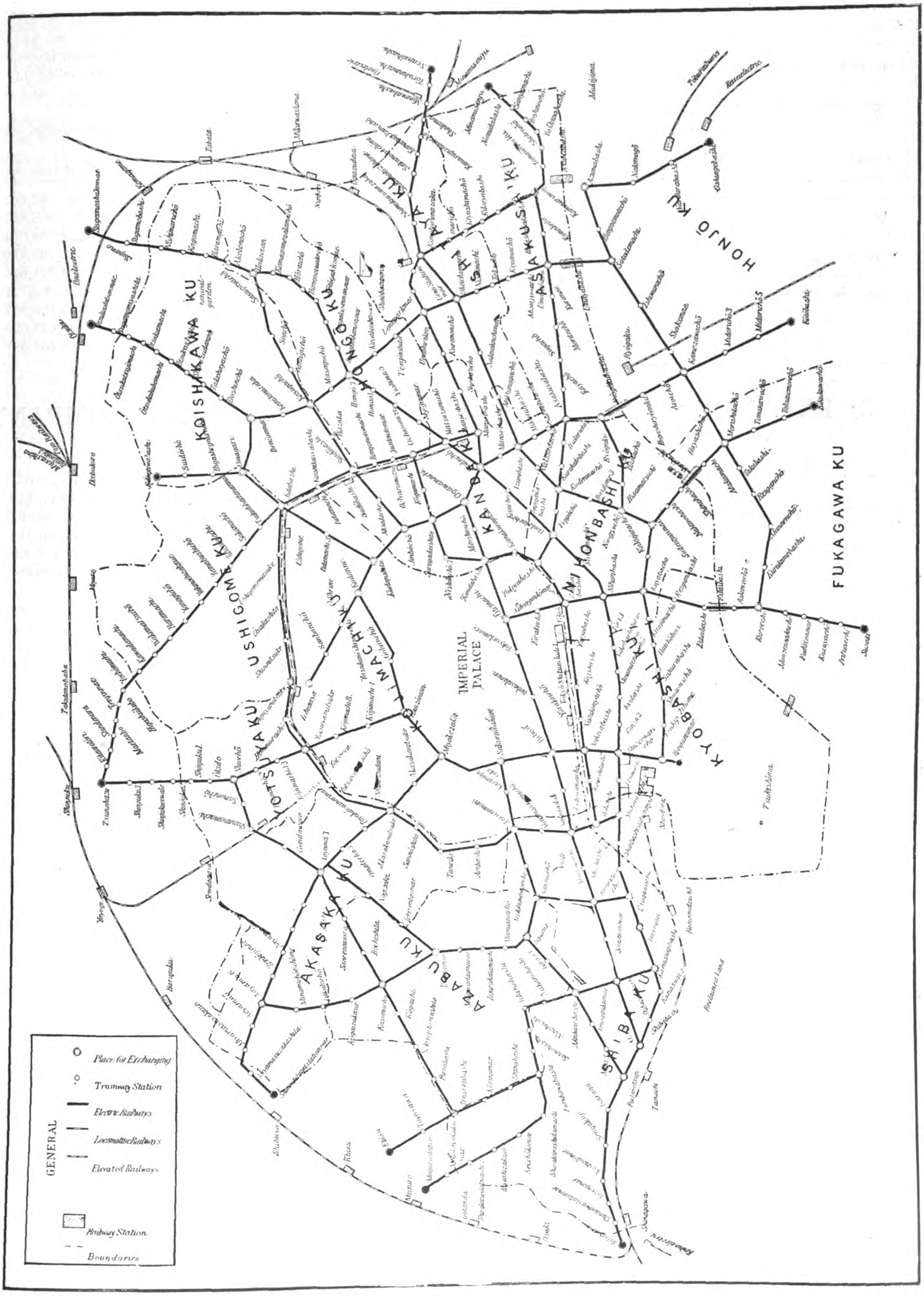
Redemption to begin in April, 1922, and be completed in April, 1926.

The tram lines in Tokyo city are gauge 4 feet 6 inches, and the rails are of various weights, 75.92 and 100 pound rails being the principal weights. The bureau owns 458 wooden wire supports, and 8,894 steel supports, exclusively for the use of tramways. The steel supports were manufactured by the National Company.

Ordinary D.C. Railway motors, manufactured by Dick, Kerr & Co., the General Electric Co., The Shibaura Engineering Works, the Mitsubishi Dockyard Co., are installed on the trams. The small cars are equipped with two motors of 25 h.p. each, and the bogie type cars carry either 2 motors of 35 h.p. each, or 2 of 50 h.p. each.

The city purchases power from the Kinugawa Hydro-Electric Power Co. In May 1922 the city used 220,364 kilowatts, which was handled by transformer stations throughout the city. The city owns a coal-burning power plant at Shinagawa where 5,600 kilowatts are generated for reserve in case of need. The bureau owns 11 car barns in different parts of the city.

SKETCH MAP OF TOKYO TRAMWAY SYSTEM



In 1918 a plan for continuing construction to be completed in 1925 was adopted. Of a total of 86 miles of new lines licensed for construction 54 miles will be completed in the very near future. The old tracks have been greatly improved, and in the important traffic districts have been newly laid with 100 pound groove rails. Old carriages have been replaced on the main traveled lines with the newest bogie type of cars. Bridges throughout the city are being rebuilt so that the trams will not crowd the normal street traffic. The total expense of all the improvements is estimated at Y.132,300,000, and the funds are being raised by bond issues as the need arises. These bonds are being floated both at home and abroad.

When the work is completed there will be 224 miles of double track tram lines in the city of Tokyo. The number of cars will have been increased to 2,050, of which only 600 will be the small type. The number of transformer stations will be increased to 25, and the number of car barns to 23.

But even when all this work is completed there will remain 32 miles of lines licensed for construction not yet begun. As population increases the traffic grows, and it is expected that work will be commenced on these licensed lines as soon as the widening of the city streets has been effected in accordance with plans recently adopted by the municipality. The municipality will seek new licenses to construct lines along streets now being widened in the most crowded districts.

The population of Tokyo and neighboring towns and villages has grown since 1913 as follows:

	Population	Number of Passengers Carried in Tokyo Trams
1913 ..	2,393,450	245,742,663
1914 ..	2,493,040	257,098,627
1915 ..	2,655,572	261,738,064
1916 ..	2,733,456	264,703,419
1917 ..	2,861,326	296,211,645
1918 ..	2,871,234	336,703,721
1919 ..	2,973,861	395,199,537
1920 ..	3,058,392	400,636,035
1921 ..	3,168,145	448,408,087

3. EXPANSION OF THE TOKYO ELECTRIC LIGHT COMPANY

Japan's Greatest Corporation

The tendency to centralize electric enterprises by mergers and purchases of competing companies is steadily growing more remarkable; so much so that the electric enterprises in the Kwanto district have practically passed into the hands of the Tokyo Electric Light Co., Ltd.

Since the Tokyo Electric Light Co., Ltd., amalgamated the Nihon Electric Light Co., Ltd., in 1890, this company by February, 1922, when the latest amalgamation of the company was concluded with the Katsuragawa Electric Power Co., Ltd., had annexed or purchased 14 companies.

The greatest number of mergers and purchases of other companies has been carried out since its capital was doubled to Y.100,000,000 in 1919. The expansion of capital, as well as the advance of its importance became particularly remarkable after 1920. For instance six companies were merged in the Tokyo Electric Light Co., up to the end of 1916, and the consequent increase on capital amounted to only Y.6,770,000. But after 1920 eight companies were amalgamated and the increase of capital was Y.122,990,000.

How rapid has been the recent expansion of the Tokyo Electric Light Co. can be noted from the following facts. The companies either annexed or purchased by the Tokyo Electric Light Co. before 1916 were located exclusively within or around the city of Tokyo. Since 1920, however, the sphere of operation of this company has been extended to eight prefectures, Tokyo, Chiba, Kanagawa, Yamanashi, Saitama, Gunma, Ibaraki, and Shizuoka prefecture, and power is generated and supplied within a radius of 100 miles from Tokyo city.

The following companies have been merged with the Tokyo Electric Light Co., in the course of its history:—

Name	Value accepted	Date of merger.	
Nihon Dento K.K.	Y.300,000	Jan.	1890
Shinagawa Dento	225,000	Aug.	1902
Fukagawa Dento	150,000	Sept.	1906
Hachioji Dento	15,000	Jan.	1906
Tokyo Denryoku, K.K. (Power Co.)	6,000,000	May	1907
Edogawa Denki K.K.	80,000	Dec.	1916
Nihon Dento K.K. (another company)	24,000,000	March	1920
Tone Hatsuden K.K.	22,000,000	April	1921
Tone Kido (Tramway) K.K.	240,000	April	1921
Yokohama Denki K.K.	20,000,000	May	1921
Daini Toshin Denki K.K.	5,000,000	Oct.	1921
Takasaki Suiryoku K.K.	8,500,000	Feb.	1922
Kumagawa Denki K.K.	750,000	Feb.	1922
Katsuragawa Denryoku, K.K. ..	42,500,000	Feb.	1922

As a result of these continuous amalgamations and purchases the authorized capital of the Tokyo Electric Light Co., Ltd., reached Y.222,000,000 in October, 1922. Compared to 1890 when the merger with the first Nihon Electric Light Co., Ltd., was made, the authorized capital has increased 500 times. One thing that must not be overlooked in this expansion is that the increase by amalgamation alone has amounted to Y.129,760,000.

In keeping with the expansion of capital, the capacity of supplying power of the Tokyo Electric Light Co., has made a great stride. In November, 1914, on the basis of 100 for November, 1880, the index for power generated had increased to 2,080; at the end of May 1922 it had reached 4,600. The fact that the increase in electric lights supplies was only 260 per cent. shows how great has been the increase in the power supply.

(2) *Index of Power and Lights Supply.*

	May end 1916	Nov. end 1919	Nov. end 1921	May end 1922
No. of lights	113	139	238	262
No. of houses	107	118	214	239
Motors (h.p.)	137	296	489	541
No. of houses	128	280	563	614
Power gene. equipment (converted into kilowatts)	496	2,082	3,698	4,604
No. of houses supplied..	143	500	1,294	1,565

Note.—This study is made on the basis of 100 for November end 1914.

At the end of May, 1914 the Tokyo Electric Light Co. generated 44,000 kilowatts of which only 656 kilowatts were sold to others. During the war the supply of power increased immensely, but as the company then engaged chiefly in supplying power in large quantities only, the number of companies, as well as the area of supply, was not so great as it is to-day. The names of companies and amounts of power they use from the Tokyo Electric Light Co., are given in the following table. May, 1922:—

Keio Denki (tramway)	500 Kw.
Kinugawa Denki (from main office)	7,650 „
Kinugawa Maebashi branch	5,550 „
Keisei Denki (tramway)	670 „
Akigawa Suiryoku	50 „
Joto Denki (tramway)	100 „
Saibu Kido (tramway)	150 „
Ikegami Dentetsu	100 „
Fuji Gas Beseki	4,000 „

Yokohama Shiden (municipality)	750	Kw.
Teikoku Dento (7 places)	2,255	„
Honjo Denki	50	„
Ryomo Denki	30	„
Azuma Kido (tram)	150	„
Sosha Suiryoku	150	„
Nishigami Denki	100	„
Karasugawa Denryoku	350	„
Nihon Denki	120	„
Tsuru Dento	580	„
Kyoto Denki (tram)	50	„
Saitama Dento	600	„
Gyoda Dento	350	„
Kasukabe machi, Denkibu (town)	60	„
Chiba Dento	1,270	„
Ditto (uncompleted)	300	„
Shimotsuke Denryoku (two places)	230	„
Ishioka Denki	326	„
Musashi Dentetsu (railway)	3,500	„
Aiko Denki (unfinished)	40	„
Kofu Denryoku (ditto)	300	„
Tokyo-shi Denki Hyoku	8,500	„
Ditto (unfinished)	1,150	„
Keihin Dentetsu (rail)	4,200	„
Tanimura Dento	30	„
Katsura Dento	80	„
Gunma Denryoku	100	„
Total	44,391	„

The power generated by the company's power plants is given in the following table :—

	Capacity in Kilowatts		Power received
Main office	61,600	Reserve : 12,000	33,750
Yoko. prma branch	14,525	5,550	9,500
Maebashi branch	14,343	—	4,500
Old Katsuragawa	30,886	10,000	1,800
Old Takasaki Suiryoku	3,355	—	2,000
Old Kumakawa Denki	3,657	—	—
Total	128,366		51,550

Note :—This study is made on the figures of end 1921, according to the highest capacity.

The Tokyo Dento supplies 34 large companies with all their power, and their total consumption is 44,390 kilowatts, about one-third of the company's total generating capacity, which is 124,460 kilowatts.

This company is said to be considering amalgamations with many other companies operating in the Kwanto districts. At the present time, in capital, and influence, it is Japan's greatest corporation.

Cement Industry in Japan

DOMESTIC cement manufacturing companies in Japan number as many as twenty-three now, being equipped with Y.43,-000,000 in all and they have made such a development that their products will be calculated by 10,000,000 barrels as a unit.

When the economic world was in a prosperous condition, the cement industry began to prosper, though the manufacturing costs rose steadily due to a steep ascent of sundry expenses, but as the demand for cement increased and its market price rose to Y.16 a barrel, the cement industry developed steadily. The market then began to show a downward tendency and the demand for cement suddenly decreased in volume, causing its market price to steadily decline until cement manufacturers were obliged to enter into an agreement for curtailing their products by 30 per cent.

Since last autumn, the tide has turned, not only was the stock of 800,000 barrels quickly disposed of, but its market price reached Y.7.8 a barrel.

The cement production figures for 1921 are still unknown, but it is believed to have amounted to no less than 8,200,000 barrels, and the production of this year is estimated to amount to 9,000,000 barrels.

For the sake of comparison, the following figures of production and sale during the past thirteen years are listed in decimals of 1,000 barrels.

Year	Amount of production	Sold	Carried over to next year
1909	2,541	2,136	771
1910	2,638	2,751	659
1911	3,193	2,370	482
1912	3,804	3,305	981
1913	3,742	3,678	1,044
1914	3,625	3,861	809
1915	3,943	3,943	809
1916	4,495	4,747	557
1917	5,502	5,483	576
1918	6,640	6,758	458
1919	6,445	6,236	666
1920	7,852	7,767	894
1921	[8,300]	7,900	934

(The figure bracketed is a rough estimate.)

As shown in the above table, both the amounts and sales have trebled since 1909, and as for the amount exported it is only about 20 per cent. of the total amount produced.

The countries to which Japanese cement are exported are listed below with the annual exports in decimals of 1,000 barrels.

Year	China	Kwantung Province	British India	Britsh Straits Settlement	Dutch India	Philippine Islands	Hongkong	Total
1913	9.7	101.6	5.9	1.8	0.1	36.5	1.2	156.8
1914	22.1	98.3	19.0	6.8	16.6	72.7	9.7	262.7
1915	51.5	26.6	211.8	41.5	121.1	129.9	9.1	703.8
1916	81.2	69.9	147.1	70.3	192.8	94.9	—	678.7
1917	35.9	62.6	83.3	44.6	263.3	23.8	1.1	528.6
1918	36.0	185.3	78.4	106.1	384.8	82.7	—	907.8
1919	65.5	413.6	92.7	46.9	243.4	130.9	—	1,005.0
1920	80.2	161.4	39.6	64.2	429.2	386.6	—	1,161.2
1921	168.1	178.9	122.1	14.3	311.8	159.6	—	996.2

Chosen Railways in Distress

Without exception, railway companies in Chosen are now in distress, owing to tightness in money circulation. The present state of railway enterprises is reported to be as follows :

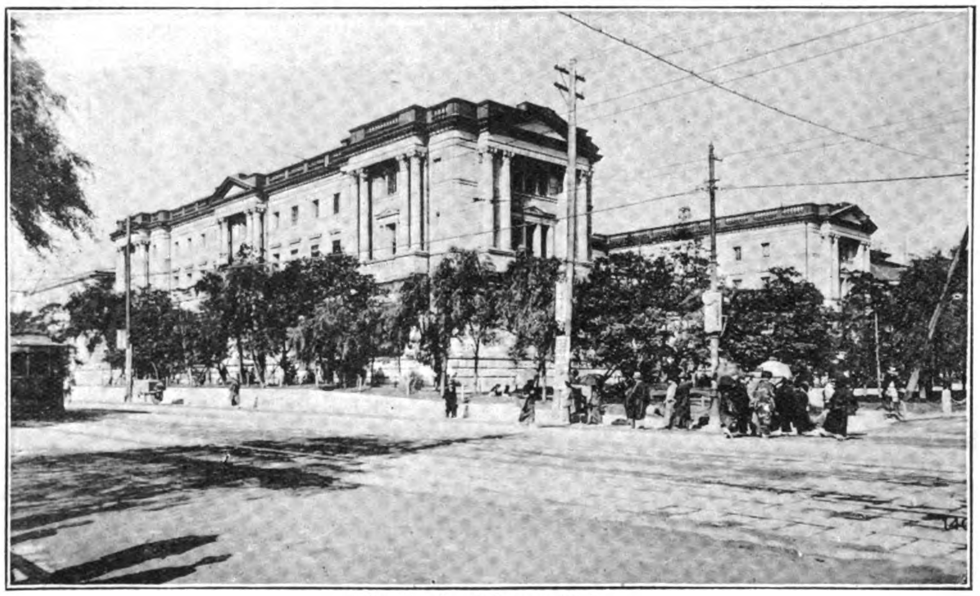
1. The lines now in full operation are four in number, including the Zenhoku-Kannan, the Chosen Gas Electric, and the Fusan-Torai Railways.
2. Those with only a part of their construction completed are five, viz., the Chosen Central, the Chosen Shokusan, the South Chosen, the Keinan, and the Tomon Railways.
3. Those now under construction are also five in number, viz., the Sanyo, the Ryoko, the Takurin, the Shinrin, and the Kongosan Electric Railways.
4. Those whose construction has been permitted by the government, and the enterprises launched are three, the North Chosen, the Keishun Electric Railways, and one other.

When the construction of all these railways is completed, the total mileage will reach 1,675.4 miles. But the mileage, now being operated upon, is only 286.7 miles ; while that of lines now under construction amounts to 89.5 miles, and that of those, the construction of which will shortly be begun, reaches 155.6 miles. As to when the remaining mileage will be constructed is as yet unascertainable.

The cause that has brought about these results is the tightness of money circulation in the peninsula. The railway companies are invariably in distress, due to the same reason, as raising funds is now impossible, the shareholders strenuously objecting to paying up, when the market prices of shares are far below the amount already paid up.

Growth of Large Banks in Japan

WITH the commencement of the European war there was more than one precedent smashed in Japan. Business conditions were unprecedented, and the prosperity of the money market also became unprecedented. This development of the money market falls into two parts: the development of organs of circulation, and improvement in methods of transactions. The development of the banks belong to the development of the organs of circulation. The beginnings of the use of call money, the extension of discounts, and the issue of debentures fall under the improvement in transactions. There is naturally a great connection between the two. For instance as the banks developed, their reserves were placed on the money market, and discounts were re-discounted and the proceeds reinvested in the money market. Then as the market developed the banks expanded their transactions. Accordingly if one wishes to understand the development of the money market in Japan during the war, one must study both manifestations. In this article, however, only the development of the banks will be discussed.


The Bank of Japan, Tokyo

The most noticeable feature of the bank history during the war is the decrease in the number of companies engaged in banking business. Before the war there were 52 special banks, semi-governmental institutions, and 1,614 ordinary banks, and 684 savings banks. Of the savings banks, 159 were only savings departments of ordinary banks, so that the number of banking institutions was only 2,155 in all. This seems an extraordinarily large number, but the reason for the existence of so many banks is not hard to discover. It was popularly believed that the banking business in Japan involved no risks to investors, and the business was also socially one in which the sons of gentlemen could engage. The government was also strongly in favor of the establishment of banks, and put practically no limit on the number of licenses it would issue. Furthermore, before the war, there were only a few men in all Japan who were at all capable of organizing and operating great banking businesses, so that the number of small banks was remarkably great.

With the continuance of the war there came a great advance in the commercial and industrial needs of Japan, and great amounts of capital were required almost at once. The government then became urgent in its requests that small banks amalgamate their interests. The number of banks began decreasing every year after 1914.

Year	Special Banks	Ordinary Banks	Savings Banks	Total
1913....	52	1,614	648	1,155
1914....	52	1,593	1,658	2,153
1915....	52	1,442	657	2,153
1916....	52	1,427	664	2,143
1917....	52	1,398	664	2,114
1918....	52	1,375	661	2,088
1919....	52	1,344	656	2,052
1920....	52	1,326	661	2,039
1921....	52	1,329	655	2,036

(This list is from the annual report, 1921; bureau of banks, department of finance. Issued June 30, 1921).

(Savings banks—include savings departments of ordinary banks).

Before the war the concentration of banks was just beginning. But with the continuance of the war, the tendency to amalgamation became more and more conspicuous. At the end of June, 1921, there were 2,036 banks, a decrease of 139, since 1913. Many dissolutions were also carried out in those years but the merging of banks of small capital in large capital organization was the real cause of the decrease in the number of banks effected during the past nine or ten years.

While the number of banks was decreasing the number of branch offices was rapidly being increased. For instance, before the war, the number of branch banks in Japan was 3,153; by the end of 1918, they had increased to 4,181, and to more than 5,000 in 1920. At the end of June, 1921, there were 5,277 branch banks in Japan, an average of 1.5 branches to each main bank in 1913, increased to 2.6 branches in 1921.

Year	Main Offices	Branches	Number of branches to each main office.
1913	2,155	3,153	1.5
1914	2,153	3,352	1.6
1915	2,151	3,430	1.6
1916	2,143	3,731	1.7
1917	2,114	3,891	1.8
1918	2,088	4,181	2.0
1919	2,052	4,589	2.2
1920	2,039	5,097	2.5
1921 (June) ..	2,036	5,277	2.6

Naturally with the increase in the number of banks the amount of capital invested in the banking business greatly increased. Before the war the total capital of all the banks in Japan was Y.886,000,000, the average for one bank being Y.411,000. In 1917 capital had increased to 1,152,000,000, average for one bank, Y.546,000. By the end of June, 1921 the total capital had reached Y.2,696,000,000, and the average capital for each bank was Y.1,325,000.

Year	Number of Banks	Authorized Capital	Average one Bank.
1913	2,155	Y. 886,668,000	Y.441,000
1914	2,153	932,425,000	433,000
1915	2,151	949,303,000	441,000
1916	2,143	971,877,000	454,000
1918	2,088	1,314,408,000	629,000
1919	2,052	1,803,547,000	879,000
1920	2,039	2,643,433,000	1,296,000
1921	2,036	2,696,809,000	1,325,000

Before the War the number of banks with capital of less than Y.500,000 was 1,755 ; at the end of 1920 this number had fallen to 1,046,a decrease of 709. Banks with capital between Y.500,000 and Y.1,000,000 before the war were few in number, in 1913 there were 235, by the end of 1920 there were 497. There were only 165 banks with capital of more than a million before the war, but by the end of 1920 there were 496 banks whose capital was more than Y.1,000,000 and less than Y.10,000,000.

A capital of Y.10,000,000 in any industry in Japan was about the limit of investment before the war. There were only 14 banks, including the Bank of Japan, with that amount of capital in 1913. Excluding the Bank of Japan and the Yokohama Specie Bank the greatest bank in this class before the war was the Fifteenth Bank (Jugo Ginko), with a capital of Y.40,000,000, and the Dai Ichi (First) Ginko, and the Mitsui Ginko had capital of only Y.20,000,000 each. At the end of 1921 there were 43 banks with capital of more than ten millions, while the limit of investment had been pushed up above a hundred millions. Besides the Yokohama Specie Banks, the Mitsui Ginko and the Fifteenth Bank belonged to this super-group.

The greatest part of the loan funds of these banks is in their deposits, but besides the deposits, the capital and reserves are used in the money market. Before the war the paid-up capital of all banks was Y.616,000,000. At the end of 1921 it had increased to Y.1,712,000,000. Bank reserves in 1913 amounted to Y.218,000,-000, at the end of 1921 they had increased to Y.591,000,000, an increase of more than 150 per cent.

Year	Paid-up Capital	Reserve	Total	Index.
1913....	Y.616,000,000	Y.218,000,000	Y.834,000,000	100
1914....	645,000,000	237,000,000	882,000,000	106
1915....	651,000,000	255,000,000	906,000,000	106
1916....	678,000,000	274,000,000	951,000,000	119
1917....	776,000,000	297,000,000	1,072,000,000	124
1918....	899,000,000	333,000,000	1,232,000,000	148
1919....	1,209,000,000	366,000,000	1,575,000,000	188
1920....	1,678,000,000	536,000,000	2,157,000,000	258
1921....	1,712,000,000	591,000,000	2,304,000,000	279

Bank deposits in all the banks in Japan before the war, 1913 were only Y.2,211,000,000. They increased to more than Y.5,704,-000,000 in 1917, and at the end of June, 1921 they had risen to Y.10,353,000,000. The deposits, paid-up capital and reserves of all banks in Japan amounted to Y.12,657,000,000 at the end of June, 1921. Before the war, 1913, they were only Y.3,045,000,000 ; the increase was accordingly 310 per cent.

Year	Deposits (Y.1,000,000)	Capital	Total (Y.1,000,000)	Index.
1913	Y.2,211	Y.834	Y.3,045	100
1914	2,313	882	3,195	105
1915	2,797	906	3,703	121
1916	3,816	951	3,767	124
1917	5,704	1,072	6,776	222
1918	8,136	1,232	9,368	308
1919	9,777	1,575	11,352	373
1920	9,842	2,157	11,999	406
1921 (June) ..	10,353	2,304	12,657	410

As the amount of money in circulation increased it naturally found its way into the central money markets, Tokyo, Osaka and Naogya,the three industrial centres of the empire. At the end of June,1922, the exchange banks in these three cities held deposits of Y. 3,627,000,000 and their paid-up capital was Y.695,000,000 and their reserves were Y.286,000,000, a total of Y.4,590,000,000. Before the war this total was only Y.875,000,000, so that by the end of June, 1922, the increase was 420 per cent.

The capital of the exchange banks in the three great industrial centres, Osaka, Tokyo, Nagoya, before the war was 11.7 per cent. of that of all the banks in Japan. At the end of June, 1922, it had increased to 40.4 per cent. of the total.

The Exchange Banks in the Three Industrial Centres, 66

Year	Paid-up Capital (Y1,000,000)	Reserve	Deposits (Y1,000,000)	Total	In 'ex	Per cent-age of whole country
1913	Y.161	Y.62	Y.52	Y.975	100	28.7
1914....	208	75	741	1,025	117	32.1
19c5....	202	82	945	1,229	140	33.2
1916....	224	89	1,463	1,777	203	47.1
1917....	264	97	2,328	2,690	307	39.7
1918....	330	117	3,334	3,782	432	40.4
1919....	469	112	3,774	4,355	498	38.3
1920....	624	188	3,599	4,410	504	37.0
1921....	676	242	3,779	4,696	537	40.4
1922....	695	268	3,627	4,590	524	——

The liquid assets of the banks in these three cities at the end of June, 1921, amounted to Y.5,129,000,000, an increase of just 570 per cent. since before the war. They comprised 29.3 per cent. of the assets of all the banks in the country before the war, and 40.5 per cent. after it.

Twenty-two banks before the war had a capital of Y.571,000,-000. These banks were the Yokohama Specie Bank, Taiwan Bank, Chosen Bank, Industrial Bank of Japan, Dai Ichi Ginko, Jugo (Fifteenth) Ginko, Dai San (Third) Ginko, Mitsubishi Bank, Yasuda Bank, Kawasaki Bank, Dai Hyaku (Hundredth) Ginko, Mitsui Bank ; These banks in Tokyo. In Osaka there were the Sumitomo Bank, Yamaguchi Bank, Sanjushi (34th) Ginko, Kajima Bank, Konoike Bank, Omi Bank, Kyaku Sanju (130th) Ginko, and in Nagoya the Aichi Bank, Meiji Bank, and the Nagoya Bank. After the war the capital of these 22 banks had increased to Y.3,360,000,-000. Before the war their capital was 65.3 per cent. of all the capital of all the banks in the three great industrial centres, after the war it had increased to 71.6 per cent. Compared to all the banks in Japan before the war their combined capital was 18.7 per cent. at the end of June, 1921, it had reached 26.6 per cent. of the whole.

Electric Plants in Fukien

ELECTRIC light plants in the province of Fukien are on the increase. The Kwan Kiang Electric Light Co. has again increased its capital, and is making plans to supply Lienkiang district electricity by leading wires to it, for which poles are now being erected. The Tungan Electric Light Co. proposed by Wu Shih-hwang, Kienyang Electric Light Co. proposed by Chen Hsiao-sin and Yungtaihsien Sungkowchen Electric Light Co. proposed by Ling Kien-tsing have all purchased necessary machinery from abroad, and are in the course of applying for registration from the government. When once the registration and licenses of trade are granted, work will immediately commence. The Shihma Hwa Tai Electric Light Co. has resumed its operation after a period of suspension through an accident of fire.

The Nanzin Electric Light Co., Ltd. at Nanzinchen, Chekiang, has been licensed by the ministry of communications to supply electricity to the consumers at Chentseh, Kiangsu, a district being about 12 *li* from Nanzinchen.

INDO-CHINA

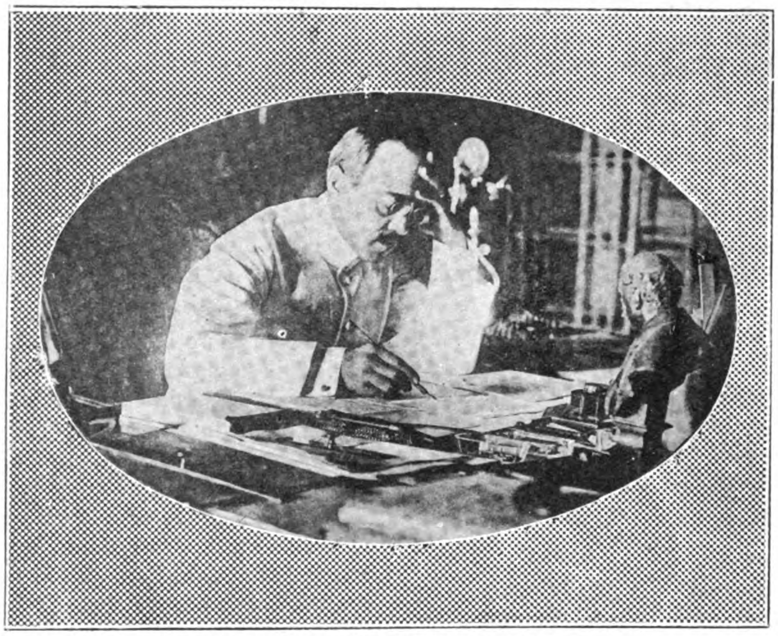
Present Conditions and Future Development

By Georges Hebmann (Chevalier of the Legion of Honor), Manager, Paris Office Guaranty Trust Company of New York, in "The Asiatic Review"

AT a time when the attention of all the civilized nations of the world is called with particular insistence to the possibilities of developing their own resources and those of their colonies, it should be interesting to cast a glance on a country which, as a result of its geographical situation, the aptitude of its population, and its marvellous natural riches, is called upon to play a part of growing importance in the economic life of the Far East. This country is Indo-China. one of the finest parts of France's colonial estate, and which, within the short lapse of time during which it has been under French rule, has given such satisfactory results, that it could be said to have justified all the hopes which have been placed in it.

ORGANIZATION

HISTORY.—At the end of the eighteenth century, France had already obtained a footing on different points of the coast of Indo-China, but the creation of this colonial domain, the history of which would be too long to relate, actually dates back to the year 1862, when France occupied the three provinces of Saïgon, Bien-Hoa and Mytho in Cochinchina, which was definitely acquired in 1867, when the three remaining provinces were taken over. In 1863 a protectorate was established over Cambodia, and in 1873 France occupied Hanoï in Tonkin. There is no need to retrace the well-known events which brought about the signing of the Tien-Tsin Treaty of June, 1885, under which China acknowledged the protectorate of France over Annam and Tonkin. Gradually the pirate bands which disturbed the peace of the country were dispersed, and in 1889 the work of pacification was practically completed. Since that time, except for a few unimportant incidents, the country which nowadays forms the "Union Indo-Chinoise" has enjoyed peace under the liberal rule of France, whose authorities, respectful of the religions and customs of the native population, have striven to gain a whole-hearted co-operation on the part of the latter. That this result may be considered as having been achieved is evidenced by the fact that during the war Indo-China furnished an important contingent of soldiers and artizans who took part in the world's struggle. Moreover, the revolutionary tendencies which became so violently manifest in other European colonies have found little favor amongst the high classes of Annam and Tonkin.



M. Albert Sarrault, Minister of Colonies

M. Maurice Long, Governor-General of Indo-China

POLITICAL ORGANIZATION.—Nowadays the various countries of Indo-China are, from an administrative point of view, grouped together under the name of "Union-Indo-Chinoise." It includes the colonies of "Cochinchina" and of "Laos" and the protectorates of "Cambodia," "Annam," and "Tonkin," to which should be added the territory of Kouang-Tcheou-Wan, leased to France by China for a period of 99 years from 1898.

The Union Indo-Chinoise is administered by a governor-general, assisted by a general secretary and a high council of government. The governor-general is the representative of the French republic, and is invested with numerous and far-reaching attributions. One of his duties is to prepare the budget bill, which, however, must be sanctioned by decree of the French president.

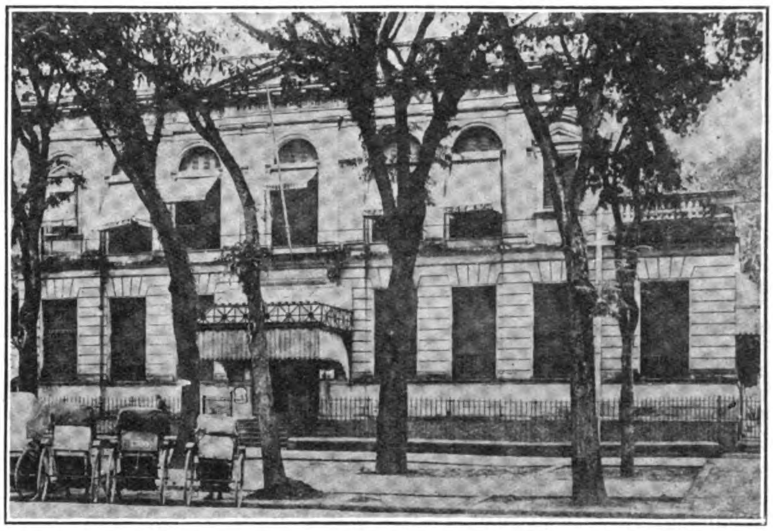
The governor-general delegates part of his powers to lieutenant-governors and residents for the administration of the colonies and protectorates respectively.

A feature of the policy of France has been the maintenance, so far as possible, of the local administration as a foundation on which to establish her rule. In protectorates the rights of the sovereigns and of the functionaries appointed by them are always respected. Furthermore, to ensure a smooth working of the French and native organizations, native assemblies have been created to be consulted on the affairs of the country.

GEOGRAPHY.—Indo-China covres an area of over 775,000 square kilometres—that is, one and a half times France's area, with an S-shaped coast of over 2,500 kilometres. This peninsula is divided lengthwise by a chain of mountains running from north to south, and separating the basins of the rivers Mékong in Cochinchina and Annam and Song-Coi (Fleuverouge) in Tonkin.

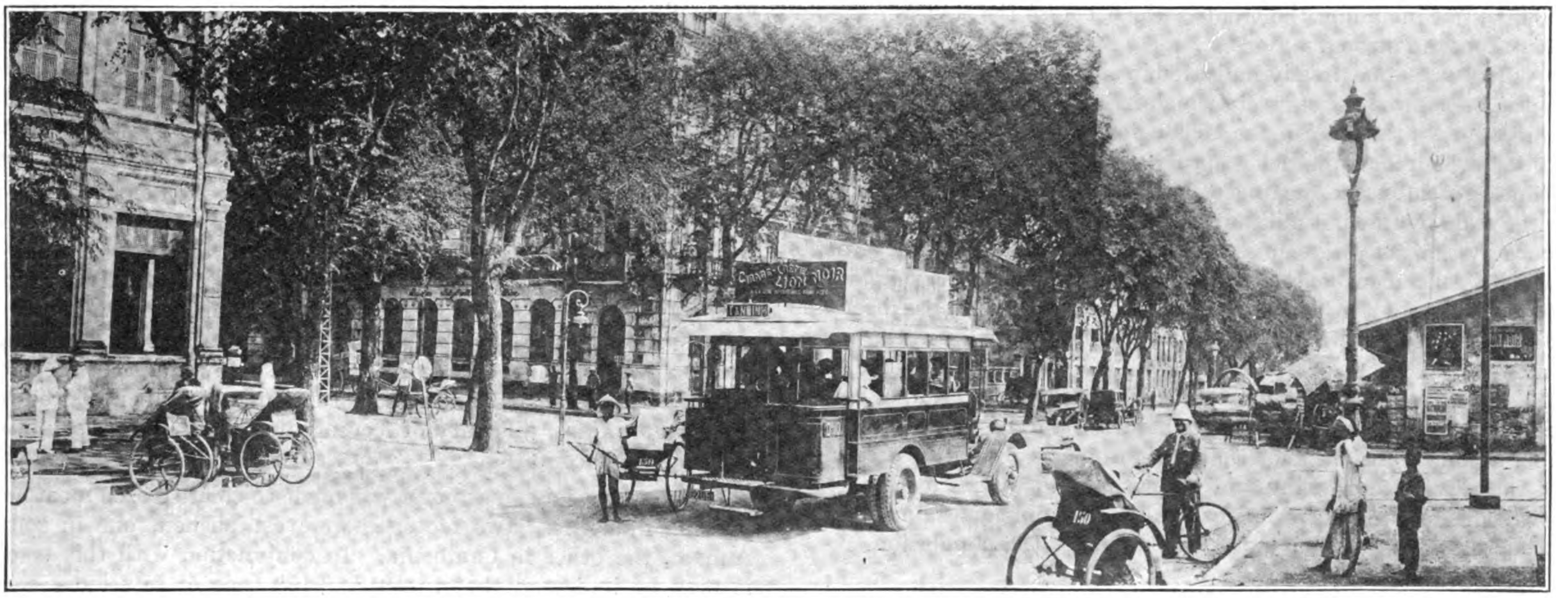
These rivers, which at high water are navigable for a large part of their course, serve as a means of access from the sea to the interior of the country and the rich provinces of Yunnan and Kouang-si in China, which now can also be reached by the Yunnanfou railway from Hanoï.

ROADS.—The network of roads in Indo-China is already considerable, and there is in particular a good road which, save for a small portion of about 80 kilometres in central Annam, runs from Lang-Son, on the Chinese frontier in Tonkin, to Battambang in Cambodia, near Siam, so that in a few years, when bridges or ferry-boats are established on the Mékong and Bassac branch, it will be possible to drive in an automobile from China to Siam along the whole coast of the peninsula.



Saigon Branch of the Banque de l'Indo-Chine, the principal financial institution of the Colony

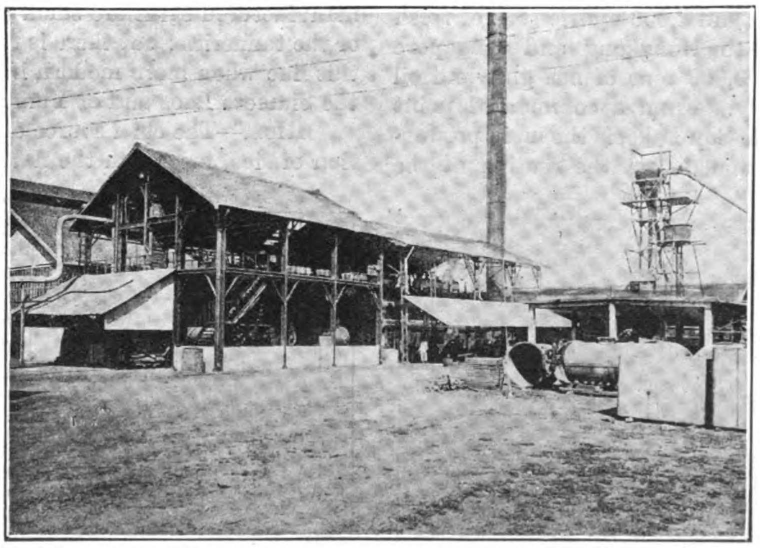
RAILROADS.—As regards railroads, the lines in operation extend over 534 kilometres in Co-



Saigon : Quai de Belgique corner of rue d'Adran, showing type of Autobus for public service

chinchina and south Annam, 174 in Central Annam. In Tonkin the network is more important. The lines which radiate from Hanoï (pop. 107,000) are the Hanoï-Na-Cham line to the Chinese frontier (167 kilometres), the Hanoï-Vinh-Benthuy line (326 kilometres), running along the coast in a southerly direction, and finally the Haïphong-Hanoï-Laokay line (383 kilometres), built by the colony, but operated by the Compagnie Française des Chemins de Fer de l'Indo-Chine et du Yun-Nan, which built also the extension Laokay-Yunnanfu, penetrating into Chinese territory. This last line, in the construction of which the engineers had to overcome the greatest natural obstacles, is now extremely prosperous, owing to the importance of the traffic of the rich provinces of China.

PORTS.—There are numerous small ports, but there are only two so far of real importance: They are Saïgon (pop. 83,135), in Cochinchina, which, at the mouth of the Mékong, and with its important fluvial port of Cholon (pop. 226,537), is a most convenient outlet for the products of the rice provinces of south Cochinchina, Cambodia, and south Annam; the other is Haï-Phong (pop. 74,917), in Tonkin, which is on the direct route from southern China to the sea. In 1919 over 4,000 ships, representing a tonnage of 2,300,000 metric tons, entered Saïgon harbor, whereas the figures for Haï-Phong were about 3,400 ships, with 667,600 metric tons, in 1918. Tourane is the port of central Annam, and later on may assume greater importance when better means of communication to distant Laos are established over the mountainous regions of Annam.



One of the plants of the Societe Francaise des Destilleries de l'Indo-Chine, the largest distillers of the French Colony

POPULATION.—Indo-China is, as a whole, sufficiently populated, so that its economic development is not likely to be hampered by the lack of labor, as is the case in many new countries. The whole population exceeds 17 million inhabitants, corresponding to an average of 20 per square kilometre. This appears comparatively small; but it should be borne in mind that an enormous area of the country is thickly wooded and mountainous, so that, while the

Saigon Arsenal, equipped with complete Shipbuilding and Repairing Plant. The s.s. "Albert Sarraut" on the ways ready for launching

proportion is only 2 inhabitants per square kilometre in the Laos district, 10 in Cambodia, 27 in Annam, it rises to 53 in Cochinchina, and 59 in Tonkin ; in the delta of the Song-Coi it even exceeds 333.

The white population, which is mostly French, numbers about 20,000, not including the troops, which before the war were about ten thousand strong.

Rivers.—As already indicated, a salient feature of Indo-China is the great number of rivers which irrigate practically all parts of the country ; the largest, the Mékong and the Song-Coi, end in wide deltas, which form the richest provinces of Indo-China. In Cochinchina especially the digging of the canals, which was begun on a large scale by the first military chiefs, and which has been continued since by the successive governors, is one of the finest achievements which France can boast of having accomplished in her colonies ; a consequence of the continuation of this wise police has been the development of the rice production, which has trebled in the course of twenty years.

The conditions of living of the population have been, of course, determined by the geographical characteristics of the country, and this accounts for the fact that Indo-China is primarily a country of intensive rice growing and of marine and fluvial fishing. The local consumption of fresh fish is enormous, and comes immediately after that of rice, which is the staple food of the population.

Natural Resources.

Fishing Industry.—In favorable years Indo-China exports over 30,000 metric tons of dried fish and 2,000 metric tons of fresh fish to neighboring countries, and to Hongkong and Singapore especially. As by-products, about 3,000 tons of fish glue and oil are shipped from the colony yearly. From a commercial point of view, Camboda, with the big Tonle-Sap Lake, is the main productive centre, and it should be mentioned that the renting of the fishing licence is an appreciable source of revenue for the Government.

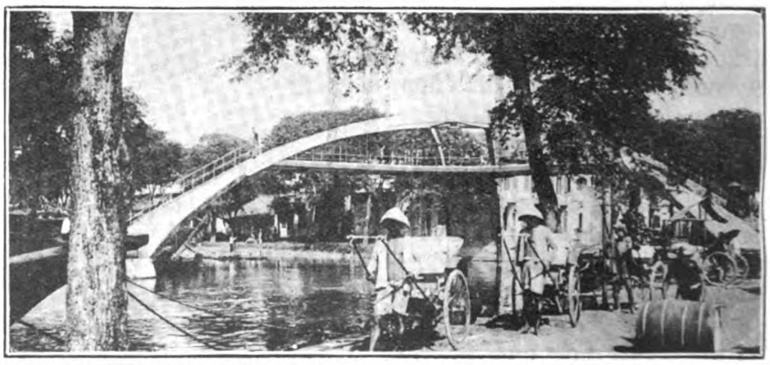
The fishing industry could beyond and doubt be further developed if the obsolete methods still used by the natives could be gradually replaced by trawling. Though competition may come from Japan, and perhaps from the Philippine islands, so great is the demand from China that this country is likely to remain always a good market for the Indo-Chinese production ; at the same time the fish oil industry could be also intensified, and larger exports would be easily absorbed in France or other European countries.

Cattle.—Before turning to the capital question of rice production, we may say a few words of cattle raising. The most recent census reported in Indo-China 3,000,000 head of cattle (including 1,500,000 buffaloes) and 2,660,000 pigs ; out of this total there are 1,200,000 oxen and buffaloes in Cambodia alone, which, in 1910, was able to export 31,594 oxen and 15,975 buffaloes to the Philippine islands (33,000 oxen and buffaloes in 1911). However, the prospects of a great development for cattle raising are as a rule impaired by violent epizootics, difficulty of feeding during the dry season, and other climatic conditions.

In recent years an attempt was made to create frozen meat and packing industries ; two factories were established, one in south Annam, the other in Cambodia. In conjunction with this trade, it may be indicated that in 1913, 3,139 tons of raw hides were exported from the colony, one-half of which went to France, the other half being shipped to China and Hongkong. Exports of manufactured skins are small (783 tons) owing to the imperfection of the tanneries ; but there is the possibility of a great expansion in this line when more modern installations attract the production of the Siamese Laos and of Yunnan.

Rice.—The chief source of riches for Indo-China is the cultivation of rice, for which the natural lay of the country and climatic

Chinese Rice Mill at Cholon



Arched Reinforced Concrete Bridge at Cholon (Saigon) erected by Brossard et Mopin

conditions are most suitable. The rice fields now under cultivation cover about 4 million hectares (over 1,500,000 in Cochinchina, 900,-000 in Tonkin, and 700,000 in Cambodia). In 1920 the area sown with rice was 4,800,000 hectares, but there is still the possibility of recuperating about 1,800,000 hectares. The qualities of the rices grown, when carefully selected and hulled, compare most favorably with the best Burma and Java descriptions, but owing to the fact that until recent years the whole rice manufacturing was in Chinese hands and the methods generally defective, the Indo-Chinese varieties were generally considered as inferior ; efforts are made now to have selected seeds giving a better yield both in quantity and quality. Three or four years ago two important rice factories, operating with up-to-date equipment, were established in Cochinchina and Tonkin. The native consumption takes up about 3½ million metric tons of rice yearly ; up to 1913 the production averaged about 4½ million tons, so that one million tons was available for exports. As production has developed, the exports have gone up from 250,000 metric tons in 1868 (1,286,804 tons in 1913) to 1,619,-715 tons in 1918 ; for 1919 the exports amounted to 966,835 tons only. This big decline was due to the rise of the Indo-Chinese piaster, which exceeded that of the Indian rupee, so that rice importers were induced to make their purchases in Burma. These figures show Indo-China to rank immediately after Burma for rice exports ; most of these go to China, Japan, and the Philippine islands through Hongkong. Though competition may become keener, the situation of Indo-China in the middle of a population of over 500 million of rice-eaters is a guarantee of a sure outlet for her surplus. Besides, in the last twenty years export to Europe has been steadily increasing, and France under normal conditions is likely to become an important customer for her colony.

Other Cereals.—Another cereal prospers in Indo-China ; this is maize, which until recent years was hardly known outside Tonkin ; now its cultivation spreads over all the regions of the Union Indo-Chinoise, and it seems to be well adapted for Cambodia especially. Exports, which amounted to only 107 tons in 1904, reached a maximum in 1913 with 133,000 tons, and have averaged 54,000 tons since.

Other produce are manoic, arrowroot, sweet potatoes, beans and peas, the production of all of which might easily be developed in Cochinchina and Tonkin, to leave a surplus available for exportation to Europe; thiere are also numerous fruits—mangoes, mangosteens, ananas, and letchis—but they are mostly consumed in the country, and some years would elapse before export could really become important. A first condition would be to have steamers adapted for the carriage of tropical fruits.

Coffee.—Coffee can also be cultivated with success. Advantages have been granted to planters in the way of a premium paid on exports to counterbalance the abnormal value of the local currency. The exports barely attained 234 metric tons in 1909 ; they were more than doubled in 1919 (534 metric tons).

Tea.—Indo-Chinese tea, though inferior in quality to China tea, is generally admitted to be quite as good as the Ceylon brands, and with some efforts to improve the cultivation and preparation methods, it could be made to compete successfully with English and Chinese teas on the French market, which could easily take all the production. Algeria, Tunisia, and Morocco, with an annual consumption of 3,000 metric tons, would become also excellent customers.

Sugar.—Sugar-cane growing succeeds in all regions, but great improvements are needed to obtain anything like the 10 tons yield per hectare obtained in Java, the present yield being scarcely 2 to 2½ tons ; however, in view of the enormous Chinese market at the very door of the French colony, it seems that it would be well worth trying to increase the production, which averages only 3,000 tons yearly.

Pepper.—Indo-China is a large producer of pepper (4,000 tons yearly during the war); in a certain year the exportation exceeded 6,300 tons, one half of which went to France, and satisfied the whole metropolitan consumption. Nutmeg is also an important product, though the Indo-Chinese variety meets with comparatively little appreciation in European markets (837 metric tons in 1919).

Cotton.—Among the textile plants which grow in the colony, particular attention should be given to cotton. The production is about 9,000 metric tons yearly, 6,000 tons coming from Cambodia, and the rest from south Annam. There are two kinds of cotton : one, cultivated along the banks of the Mékong, which are flooded each year, gives a short staple (18 to 22 millimetres) product, which is utilized on special looms ; the other kind, grown on the high ground called " terres rouges," of incomparable fertility, is a most excellent product, with a long staple (28 to 29 millimetres), comparing favorably with the American " good middling." Since the war a large portion of land has been cleared for cultivation, and up-to-date ginning mills have been installed with American machinery at Kompong-Cham in Cambodia ; they can produce 80 bales of 110 kilos per 12-hour day. There is another important ginning factory at Khsah-Kandal, dating back to 1891, which is in Chinese hands ; it treats about 6,000 metric tons of raw cotton yearly, producing 300 tons of oil and 1,600 tons of oil-cakes. The total area available for cotton-growing in Cambodia may be estimated at about two million hectares ; but one of the difficulties to be overcome is the lack of labor, for which the only remedy would seem to be immigration of Chinese artisans.

Silk.—Silk is another item of particular present interest in view of the keen competition of American and Japanese purchasers on the Chinese market, which render the supplying of European manufacturers daily more difficult. The silk industry was, needless to say, a fundamental one in Indo-China ; but the methods applied by the native silk producers gave comparatively poor results. Owing to constant efforts, a material improvement has been achieved not only in quantity (1 kilo of raw silk for 18 kilos of cocoons against 26 kilos formerly), but also in the quality, which can now be assimilated to the Canton first grade ; Tonkin pongees are also appreciated. Up to now, the major part of the production was utilized locally, the maximum quantity exported being 101 tons in 1911 ; but it is considered in colonial circles that the production, through private as well as official enterprise, could be tremendously increased, for the conditions are extremely favorable. There can be no fewer than five silkworm crops yearly. At present the area cultivated in Chinese mulberries is 8,000 hectares, with an output of nearly 4,000,000 kilos of fresh cocoons and 150,000 kilos in raw silk for Cochinchina and Cambodia alone ; a methodical program is now contemplated through the medium of a company founded by Lyonese producers to bring the production to 900,000 kilos of raw silk within ten years.

Textile Plants.—Other textile plants in Indo-China are jute, ramie, hemp, and kapok ; plantations of the tree from which this raw fibre is obtained could be developed to some advantage in Cambodia especially. As much may be said of the coconut tree, the present production of coir used for the manufacturing of cordage being entirely absorbed in the country.

Rushes, which are extremely abundant in the seaboard districts of Tonkin and Cochinchina and other marshy districts of the peninsula, are utilized locally for the manufacture of mats ; these articles are exported to Hongkong, from where an important portion is re-exported to Europe under a Chinese label. In the thickly-populated delta of Tonkin there is a local small industry which uses a number of other plants—rotins, latania, rice straw, etc.—for the manufacture of mats, baskets, furniture, etc.

Bamboo.—A most interesting use of the bamboo-tree is the manufacture of paper pulp. A factory was established in 1912 at Vietry, and its yearly output amounts to about 3,000 metric tons of excellent wood pulp, part of which is utilized in a paper factory at Dap-Cau. This is only a beginning, and there are large possibilities for expansion, as the bamboo-trees are found in enormous quantities along the banks of the Tokinese and Cochinchinese rivers and many other regions of the country.

Until now, the soda and chloride of lime necessary for paper manufacturing have been imported from Japan ; but a chemical

factory has recently been erected at Haï-Phong for the treatment of salt by electrolysis, and will be able to supply the chemicals necessary at a much lower price.

Other plants providing good material for the paper industry are rice and " tranh," an indigenous herb growing rapidly in all parts of the colony.

Experiments are being made also with the idea of utilizing the pine trees which cover large areas in the wooded regions of the interior.

ESSENTIAL OILS.—Among vegetable resources should be mentioned such oleaginous plants as coconut-trees, sesame, ground nuts, ricinus, and soja. In 1914 the exports of copra reached 8,100 metric tons ; those of castor-oil were 899 metric tons ; soja cakes are excellent as cattle food, and find a good market in England.

Numerous plants are available for the manufacture of essential oils and perfumes, such as citronella, lemon grass, ylang-ylang, cajeput, camphrea, cutch, coca, indigo, etc. These resources have already been exploited, but not nearly to the extent which the possibilities warrant ; however, it should be mentioned that badian, the essential oil derived from the fruit of the Chinese anise-tree, shows up well among the exports from Tonkin ; these exports averaged 98,000 kilos annually for the period 1909-1913, with a maximum of 240,000 kilos in 1913 ; the chief market was Hamburg.

TOBACCO.—Tobacco has been grown in Indo-China for a long time for local consumption ; the native varieties are, however, unsuitable for European taste, and attempts have been made with good results to obtain better qualities. In 1920 certain quantities were imported into France for the government.

RUBBER.—Last, but not least, in view of the possibilities of development which it offers, should be mentioned the cultivation of indiarubber trees. Some twenty years ago, Indo-China exported a small quantity of indiarubber produced by the trees growing in the forests of the interior ; but the acclimatization of the Hevea has been attempted since with great success, and now practically all the products exported come from Hevea plantations. The development of this industry is shown by the progression of exports which from 175 metric tons of indiarubber (wild and cultivated) in 1910 went up to 531 in 1918, and 2,976 in 1919 of cultivated Hevea alone. The abrupt drop in the price of the " hard Para " and " Plantation Crepe " on the London market put a temporary check on the production, but it is expected that the Indo-Chinese output may be brought up to about 8,000 tons yearly some years hence, when circumstances warrant.

MINES AND INDUSTRIES

COAL.—From the point of view of mineral resources, the fact of capital importance is the presence of coal in Tonkin. There are deposits in central Annam and Laos ; but, for the time being, the Tonkin coal mines alone retain our interest. The most important are those of Hongai (operated by the Société Française des Charbonnages du Tonkin), covering 22,000 hectares in the Bay of Along, at 25 kilometres from Haïphong, with three centres of exploitation at Hongai, Hatou, and Campha. The reserves are estimated to be 12 billion tons ; but there remains a long stretch of territory to be prospected. The Hongai coal is anthracitous and, as such, ill-suited for shipping requirements. Imports of soft coal from Japan are necessary ; but it is hoped that they will be reduced in the future, as soft coal mines have recently been discovered in Tonkin. Other coal-mining concerns are the " Charbonnages de Kebao," the " Charbonnages de Dong-Trieu," and the " Anthracites du Tonkin," but the Hongai mines are by far the largest producers. Their output increased from 257,000 metric tons in 1908 to 576,000 tons in 1916 (544,000 metric tons in 1917). It could be easily brought up to 900,000 metric tons and later on to 1,200,000 tons, if the demand justified this development. The output of the other mines is only 150,000 tons. In 1917 the total output of the colony was 653,910 tons, out of which 313,680 tons were exported, the chief customers being Hongkong, the Philippine islands, and even Japan.

The importance of coal for the prosperity of the colony is emphasized by the presence of important metal mines in the vicinity of the coal, thus opening fair prospects for the creation of a metallurgical industry. Iron is found in four principal districts : (1) That of the Red River (magnetite and hematite) ; (2) that of the Song-Cau (hematite) ; (3) that of the Song-Bang-Giang (magnetite) ; (4) the Dong-Trieu mines near Hongai. Some other mines have also been located in Laos, Cambodia, and Annam, but owing to the climatic conditions, lack of labour, and of coal, they are less interesting for immediate operation.

Whilst iron represents future prospects, zinc is already a paying industry. There are rich mines of blende and calamine in the province of Bac Kan in Tonkin : their holding in pure metal exceeds 60 per cent.; the annual output varies between 30,000 and 40,000 tons yearly, most of which is exported to Europe (production, 48,825 tons in 1916, and 42,552 tons in 1917 ; exports, 38,190 tons and 19,950 tons in the same years respectively).

Other mineral products are tin and tungsten (at Pia Ouac, production 600 tons in 1918), antimony and gold (Bong Mieu—120 kilos gold) ; manganese ore (pyrolusite) is abundant in Tonkin. Graphite is found also at Quang-Ngai, whence 7,200 tons were exported in 1919.

INDUSTRIES.—This survey of the natural resources of Indo-China shows the wide possibilities of expansion which are opening up for industry there. At present, rice factories and distrilleries take the first place. The former are found practically everywhere ; they are generally small and operated by obsolete methods. The most important (ten in number in 1913) are those equipped with modern machinery ; they are owned by Chinese interests, and are established in the vicinity of Cholon, near Saïgon. In recent years two French companies have been created, the " Société des Rizeries d'Extreme Orient " (capital 25,000,000 frs.) and the " Rizeries Indo-Chinoises." The rice alcohol which is consumed by the native population is manufactured for its greater part by the " Société Française des Distilleries de l'Indo-Chine "; the manufacture is under the control of the government. There are besides a few small distilleries, the number of which is legally limited. Numerous mining concerns are already established in Indo-China, but the metallurgical industry is still in its infancy. It should be mentioned, however, that owing to the fact that the engineering industry is already well represented by the Saïgon arsenal, the repair workshops of the Messageries Fluviales, the workshops of the colony railroads and other private concerns, there exists already an important nucleus of skilled workmen.

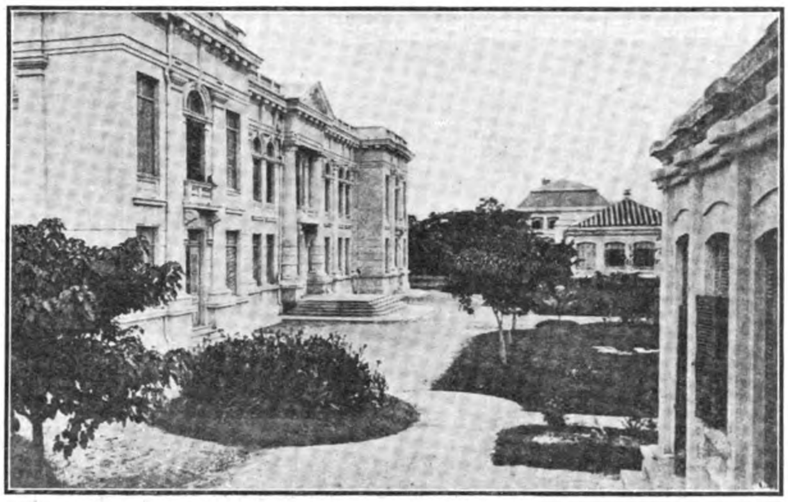
The timber industry counts a considerable number of native works. There are also a few saw mills, wood distilleries, and two match factories.

According to official figures, the number of industrial, commercial, and agricultural companies is 74, representing a capital invested of about 256 million francs ; there are, besides, 22 important private firms.

This brief review shows that much remains to be done before anything like a rational exploitation of Indo-Chinese resources is really begun ; but the fact stands out that the following products, among many others, offer great business possibilities : rice, cotton, silk, bamboo, fisheries, coal, and metallurgy. The country is sufficiently populated to supply the labor which, as a rule, is found pliable and adaptable to most kinds of occupation. In any case, China is near at hand, and could supply any amount of excellent labor.

The remarkable possibilities which are thus opening in Indo-China have not escaped the attention of the French colonial authorities. But whereas, prior to the war, there was less necessity to push on the development of the colony, the new circumstances born of the war are making it imperative that France shall devote more attention to her Far Eastern possession, which could procure her a a large portion of the raw materials (rice, cotton, silk) for which she is now dependent upon foreign markets.

Rue Paul Bert, Hanoi



Residency at Hue, Annam

Expansion—Finances, Commerce

A wide program has been recently established by the French colonial minister to equip the colony more fully for its part in the world's commercial future. This program involves the construction of 2,322 kilometres of railroad lines, and in the first place the completion of the Trans-Indo-Chinese railroad (Vinh-Dongha section 300 kilometres, and Tourane Saïgon section 530 kilometres), then the Cambodia railroad from Saïgon to Batambang, and the connecting of the Tonkin lines with the Chinese railroads ; the improve ment of the ports of Saïgon, Haïphong, Tourane, and Kouang-Tcheou-Wan ; the extension and improvement of the networks of canals in Cochinchina ; draining and irrigation works in Tonkin and Cambodia (in the latter region 7,000,000 hectares of land are barren ; 3,000,000 hectares are of exceedingly rich soil suitable for rice or cotton growing) ; the building of dams for protection against the Song-Coi floods in Tonkin ; the extension and improvement of the roads, etc.

The funds for this program will have to be provided by means of loans. But the prosperity of the colony is such that the increment of charges to be incurred on that account is likely to be easily borne. It suffices to indicate in this respect that, according to official figures, the total funded debt of Indo-China in 1920 amounted to 388,643,798 frs., involving the payment of annuities of 18,558,760 frs. As the aggregate expenses of the budget represented 98,830,741 dollars, the annuities necessary for the service of the loans corresponded to only 6.26 per cent. of the total expenses, computing the piastre at the rate of 3 frs.; but as the currency stands at a premium, the present loan charges are considerably below this percentage.

This appreciation of the local currency is not without its drawbacks, as, from the point of view of French expansion, it prevents the inflow of French capital which is so necessary to regenerate the dormant forces of this huge country.

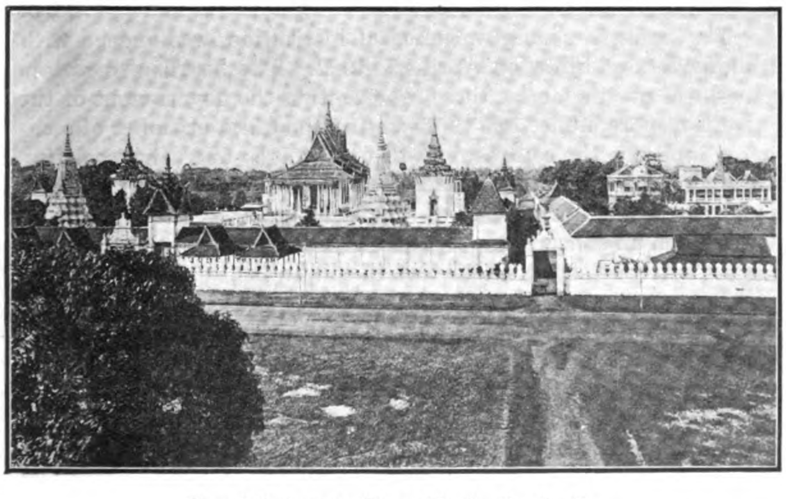
The question of the currency has been of paramount importance since the war. In 1914 the value of the piastre, which contains 24.03 grams of fine silver, was about 2.50 frs.; but the appreciation of the value of the silver metal and the decline of the franc were two factors which in conjunction with a favorable trade balance caused a tremendous rise of the piastre ; the latter attained 16.50 frs. (maximum) in February, 1920 ; subsequently there were violent fluctuations, which in consequence of the difficulties they caused in the economic life of the country necessitated an action on the part of the government ; the latter, rejecting all radical solutions, such as the creation of a gold standard, a reduction of the fine silver contained in the coins or the introduction of the franc as monetary unit, determined that the piastre notes of the Banque de l'Indo-Chine should compulsorily be accepted as legal tender (cours forcé), and that the exchange rate with the franc would be fixed from time to time by decree.

A few statistical data will serve to show the development of the foreign trade of the " Union Indo-Chinoise " in recent years :

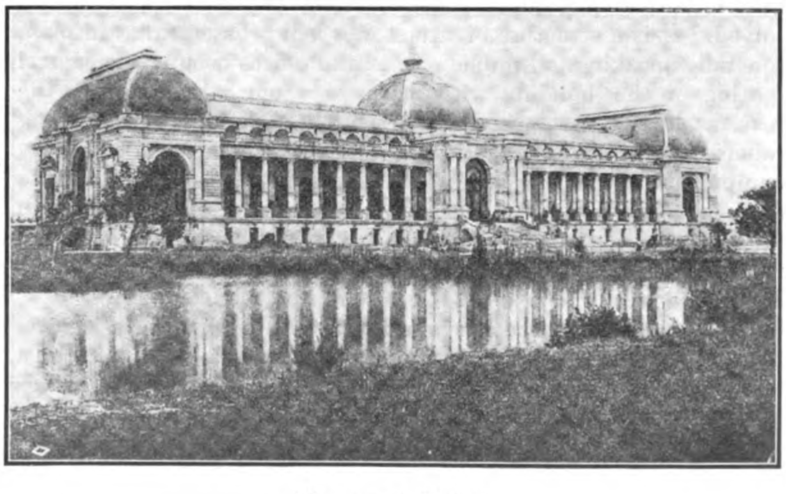
(In million francs.)

Years.	Imports.	Exports.	Total.
1913	305	345	650
1919	751	1,051	1,802
1920	1,097	1,181	2,278

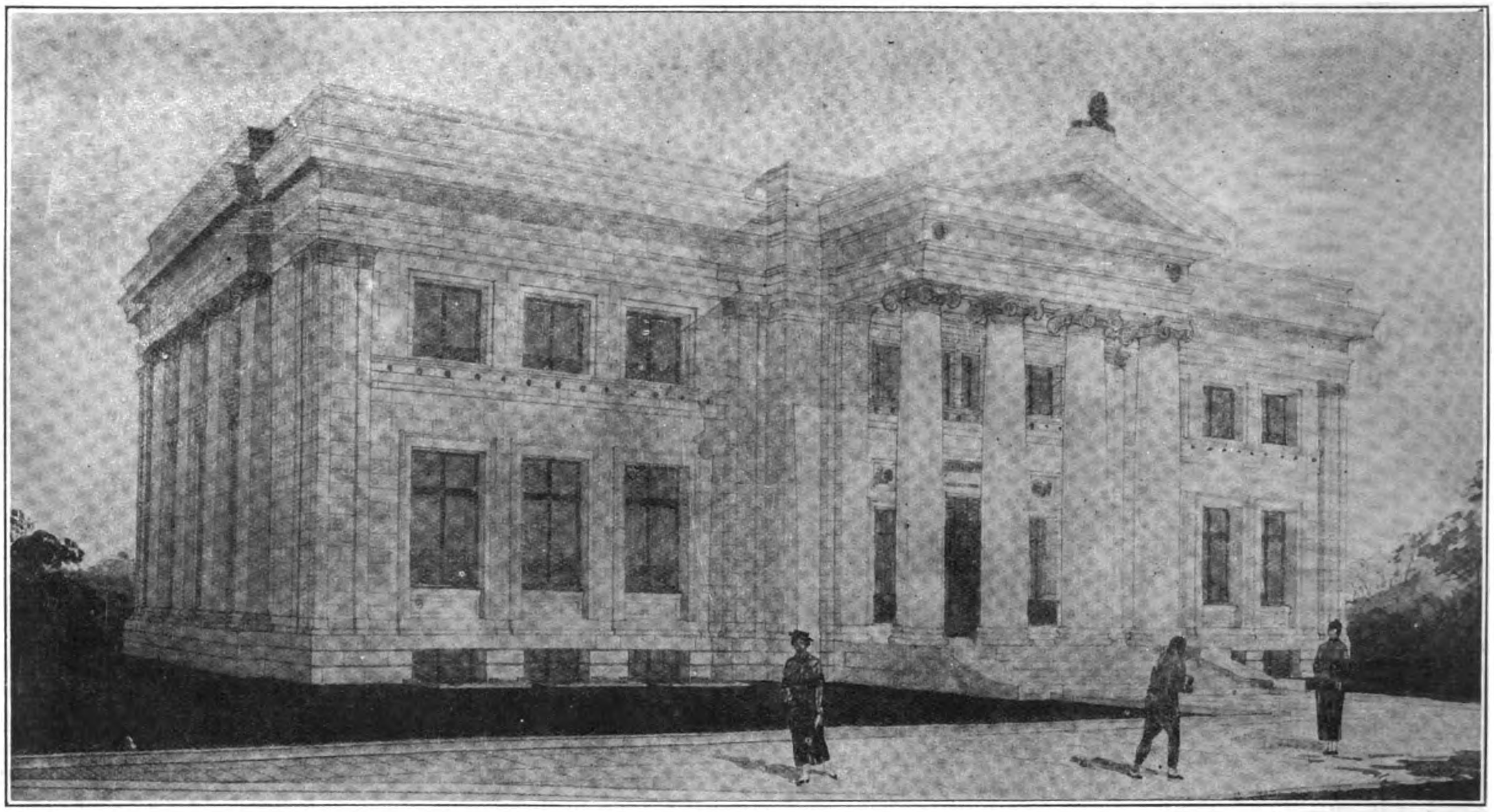
Cochinchina accounts for 72.2 per cent. of the total commerce ; Tonkin for 24.1 per cent.; Annam for 2.5 per cent.; Cambodia for 1 per cent. All the trade of Bambodia and south Annam passes through Cochinchina.



Royal Palacc at Pnom Penh, Cambodia



Museum at Hanoi



LIBRARY BUILDING FOR NATIONAL SOUTHEASTERN UNIVERSITY, NANKING

THE library building fo. the National Southeastern University, Nanking, designed by and erected under the supervision of Lam, Glines & Co., Inc., architects and engineers, Shanghai, is noteworthy not only because of the merit in the design of the building itself but also for the fact that it is the first building of its kind ever donated to the public by an individual in this country.

When the National Southeastern University found its library facilities inadequate to accommodate the hundreds of ardent scholars who pour in in increasing numbers every year, there rose in response to the need a man with a noble heart and a generous purse. A donation of a considerable sum was offered to the University for the erection of a modern library. The name of the giver is no less great than the donation itself, for he is no other than General Chi, tuchun of Kiangsu. To perpetuate the noble deed, the University has named the library after the governor's father.

As an architectural problem, this library is successfully solved. It is a structure of two stories and a basement. In plan, generally speaking, all public spaces and offices occupy the central portion of the building with the stack room extending into the rear, as by virtue of their functions they should. The reading rooms occupy the two wings and all the mechanical and sanitary equipments go in the basement. This distribution renders the different services of the whole library in perfect harmony and ease.

The architectural design of the building also bespeaks of careful study and selected taste. The order used here is Roman Ionic. The main facade is over 124 feet long and 44 feet high. It is honestly treated in three bays as suggested in plan. The central bay has a portico of four Ionic columns, 28 feet high, crowned by a pediment of singular dignity and simplicity. The freize over this portico bears the inscription "Meng Fong Library" in Chinese, "Meng Fong" being the name of General Chi's father. Under this portico is the main entrance reached by a flight of imposing granite steps. The entrance details of richly panelled oak doors with iron-grilled transom above, framed in a granite architrave with freize and cornice overhead, are decidedly refined in design.

This portico motif is recalled on the side elevations by end-pavilions, having the same number of columns, while on the rest of the wall surface pilasters are used. This treatment at once gives the building accents of interest while at the same time it imparts to it that grace and dignity which a building of this nature must possess.

The interior is also finished in classical treatments, and equipped with the latest in heating, lighting and sanitary installations. The steel book stacks used are specially ordered from America.

The building will cost approximately $160,000.00 and will be ready for use in the Spring of 1923.

The Bank of The Far Eastern Republic

The bank, a semi-governmental institution, was opened with headquarters at Chita on April 25, 1922. The board of directors consists of five members, three representing the government of the Far Eastern republic, one representing the Chita chamber of commerce, and one the centrosoyus, or union of co-operative societies. The bank has an authorized capital of 2,000,000 gold rubles, of which the government proposes to hold 55 per cent. and the remainder is open to subscription by private individuals and firms. Foreigners may buy shares under certain conditions.

Branches have been established in Verhkne-Udinsk, Stretensk, Blagovyeshchensk, Troitz Kossavsk, Bargusin, and Harbin. The Harbin branch of the International Banking Corporation is at present the principal foreign correspondent.

The balance sheet, as of August 1, including the business of the branches, without elimination of duplications, shows total assets of 4,600,654 rubles, excluding 877,950 rubles of shares unsubscribed, but including 659,160 rubles of stock subscriptions not yet paid up.

Powdered Coal: Its Application and Advantages

By W. D. Thom, Chemical Engineer

IN recent years there has been developed a new method of burning coal for heat energy; that is the burning of the coal after it has been ground to powder. Two systems are used in pulverizing coal so that it may be conveyed easily by means of a screw conveyor, by compressed air, or suspended in a stream of low pressure air.* These systems are: (1) The unit system or unit milling plant, in which one machine prepares and delivers the pulverized coal to the furnace; and (2) The multiple system or central milling plant, in which the coal is prepared in a separate building and transported therefrom to the furnaces. The unit system is located adjacent to the furnaces; Fig. 1 is an illustration of this system.

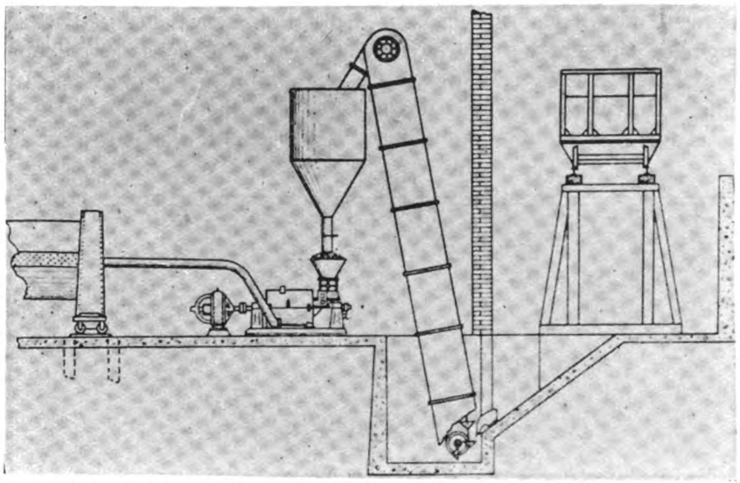


Fig. 1. The Unit System and Aero Pulverizer Supplying Pulverized Coal to Rotary Kiln

It is smaller than the multiple and is very similar in design in different industries. The multiple system is large and is used more extensively than the unit system. It consists of many different pieces of machinery and apparatus, which differ considerably in design in different industries. A diagrammatic illustration of the multiple

* "The Preparation, Transportation, and Combustion of Powdered Coal" by John Blizard, Bul. 564, Canada, Department of Mines.

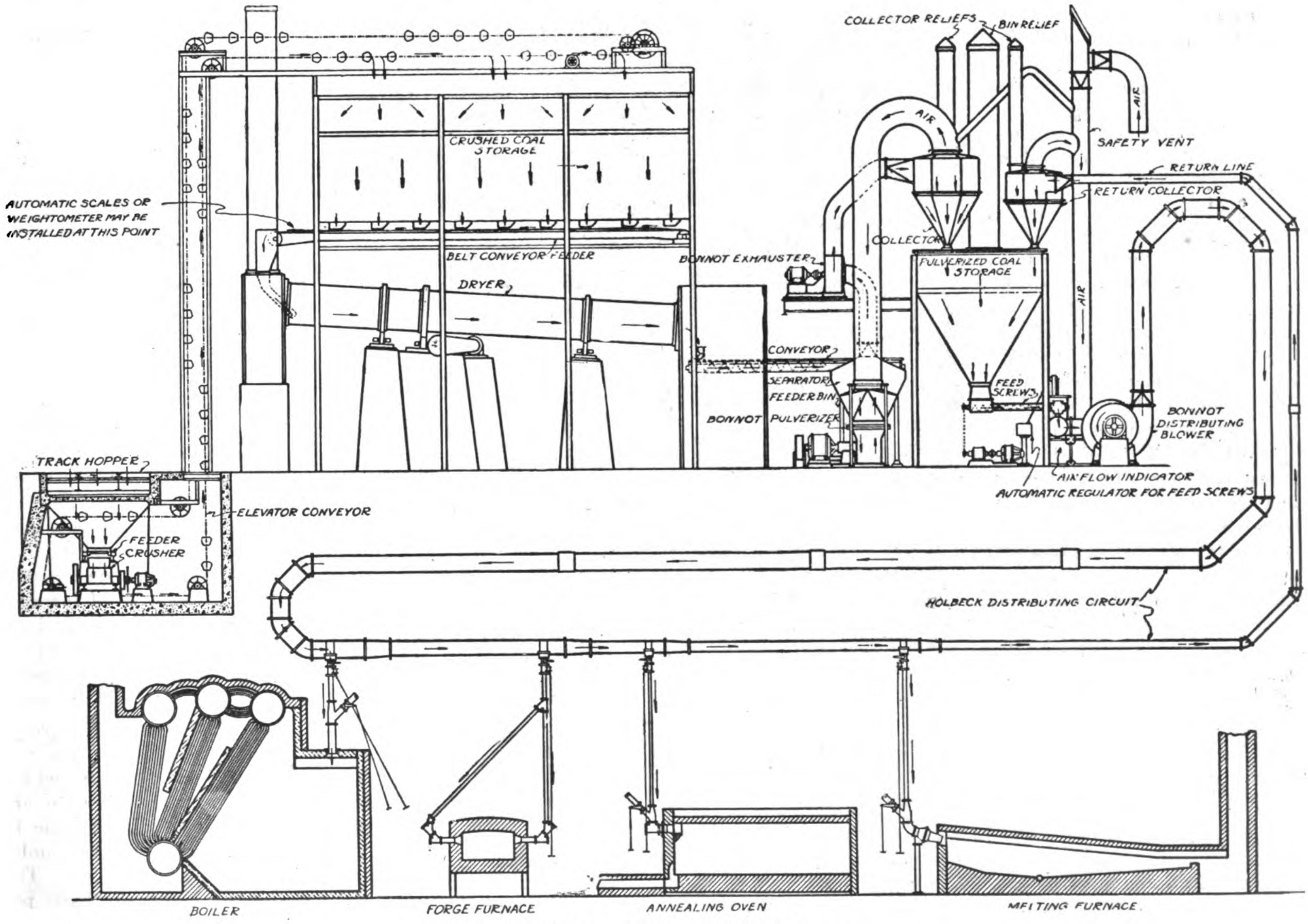


Fig. 2. Diagram of Typical Holbeck System

system is shown in Fig. 2, and the plant as it appeared under construction is shown in Fig. 3.

Both systems have been so well perfected in the United States and Canada that to-day the advantages and economies of pulverized-coal and its uses are extended into practically every industry. It is the purpose of this article to describe briefly the industrial applications of powdered coal and its advantages.

The pioneers in the application of powdered coal were the cement manufacturers, in whose plants the rotary kilns are largely used. In fact, the rotary kilns, where labor cost is greatly reduced, have been made universally possible by the use of powdered coal. The fact that the cement engineers were familiar with crushing and pulverizing problems and appreciate the value of grinding unpalpable powder, is responsible for the success in the presence of discouraging failures in other fields. Pulverized coal has been used in connection with the manufacture of cement since 1895, and to-day this industry uses the most fuel in this form. The consumption in the United States alone amounts to over 8,000,000 tons per year.

The advantages of using pulverized coal in the cement industry are found to be as follows: (1) Absolute control of temperature made possible by the flexibility of operation and simplicity of handling; (2) Absence of smoke and the utilization of practically all the heat units in the coal; (3) Production of a highly luminous flame, creating a concentrated, radiant zone, very desirable for clinkering; (4) The ash of the powdered coal is of secondary influence in the quality of the cement produced.

The operation of pulverized coal firing systems in the lime kilns as well as in the clay kilns has given valuable results to the users. At the muscle shoals air nitrate plant lime kilns of one hundred tons capacity per day were successfully operated. Fuel saving and perfect control of temperature are distinct advantages. In the kilns of the clay industry saving of fuel as high as fifty per cent. is possible. In addition to this saving the coal can be transported in pipes much the same as gas or oil; this is a considerable saving of labor, especially when the brick yards are large, and the kilns are far apart. Furthermore, compared with hand-firing, the burning period can be materially reduced, because, during the oxidation period, heat can be applied to the utmost. Oxidizing conditions can be maintained throughout the burning, thus reducing the burning period and improving the quality of the ware.

The next general application of powdered coal was in the metallurgical industries. In the iron and steel industry the principal applications are for the following classes of furnaces :—

(1) Heating furnaces: (*a*) Heating, re-heating, and forging; (*b*) continuous heating for blooms and billets; (*c*) annealing malleable iron and steel plates and castings; (*d*) sheet and pair; (*e*) tin and galvanizing pots; (*f*) soaking pits, busheling and puddling.

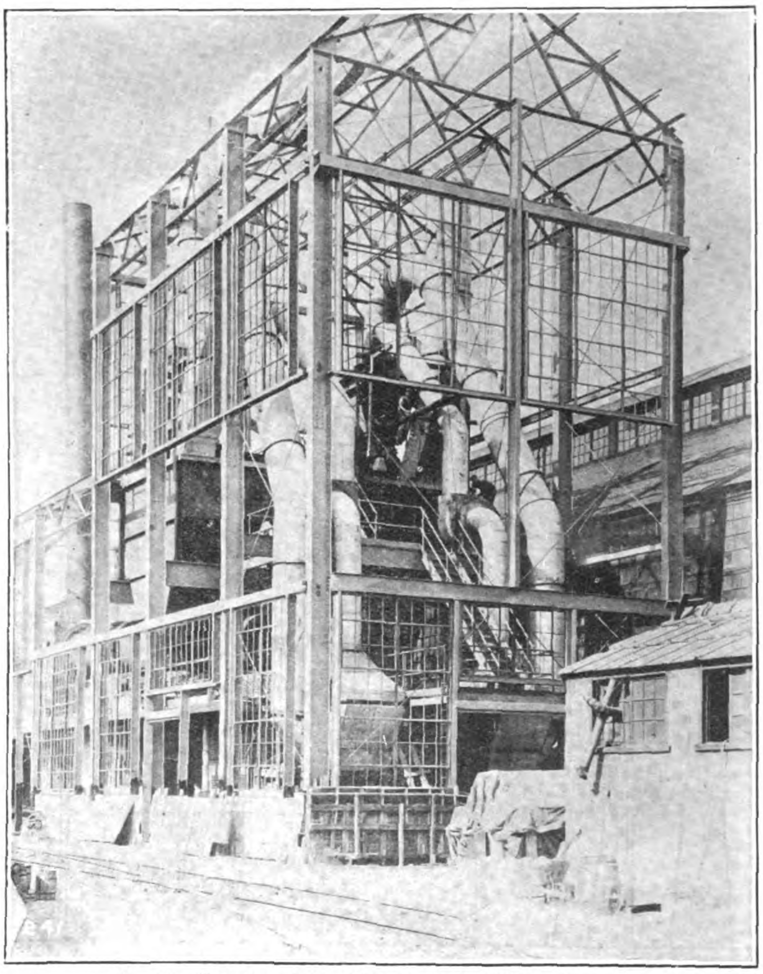


Fig. 3. Powdered Coal Plant of the Holbeck System

(2) Melting furnaces: (*a*) Open hearth steel; (*b*) malleable iron; (*c*) gray iron melting.

In the heating, re-heating, and forging furnaces powdered coal has been so successfully used that it is now displacing natural and producer gas, as well as hand-firing. The saving of metal loss, particularly at high temperatures, is very marked. The fuel savings have proved highly satisfactory to the users. (From 150 tp 400 pounds of powdered coal per ton of steel have been saved). Increased output, reduced oxidation, and consequently a better quality of product, simplicity and nicety in the control of flame conditions and temperatures, better working conditions for the operatives, are other distinct advantages. The saving of fuel in annealing furnaces runs from twenty-five per cent. up as compared with hand-firing practice. In addition to this there is a large saving in annealing box renewals. Their life is greatly prolonged; this is due to the reduction in oxidation, which occurs because of the low percentage of excess air required for complete combustion. This saving frequently is greater than that secured by the conservation of fuel. In the sheet and pair furnaces the advantages of the powdered coal flame over other methods of firing has been conclusively shown, as the percentage of patched sheets and stickers is greatly reduced. Roll breakage, due to the ductility of the steel after it has been heated by the powdered coal flame, is minimized. Due to the fact that with powdered coal firing no time is lost between turns in cleaning the fires, there is less opportunity for the rolls to chill; this also favorably influences the minimizing of roll breakage. A saving in fuel as high as forty per cent., when compared with hand or stoker coal-fired furnaces, is obtained. In heating tin and galvanizing pots, as well as in busheling and wrought-iron puddling furnaces, increased production and a reduction in fuel consumption of twenty-two to forty per cent. is obtained. In addition, labor saving as high as seventy-five per cent. is possible.

The application of powdered coal in melting furnaces has made enormous progress during recent years. In a number of plants furnaces for the melting and refining of steel by the basic open-hearth process are successfully fired with pulverized coal. It is desirable in this type of furnace, in order that the best results may be attained, that the fuel be pulverized so fine that not less than eighty-five per cent. will pass through a two-hundred mesh sieve, and than the ash contents as well as the sulfur, be low, the former not more than eight per cent.

According to N. C. Harrison,* of the Atlanta Steel Company, Atlanta, Georgia, the advantages and disadvantages in the use of powdered coal, as compared with hot producer gas as a fuel for open-hearth furnaces, from observations of its uses up-to-date, are as follows: "All the heat is generated in the furnace, while in the case of gas producer, from 18 to 25 per cent. of the heat units are lost in the producer itself, when converting coal into gas. The higher flame temperature results in a greater number of heats per

* "Pulverized Coal as a Fuel"— *Mechanical Engineering*, August, 1919.

week. Open-hearth furnaces using powdered coal operated on a very low fuel consumption fully equal to the best producer gas practice, and much better than the average of the older plants in this country; at the Atlanta plant the coal consumption is about one-third less than with producer gas. Coal can be pulverized in plants of about 100 tons daily capacity and delivered to the furnaces for approximately 50 cents per ton, which is about the same as the cost for gasifying coal in gas producers.

"The use of this fuel in metallurgical furnaces has been developed to only 75 per cent. of its ultimate value. In our plant this open-hearth furnace has been shut down oftener than the producer gas furnaces of the same size, due to checkers and slag pockets filling up with cinders and slag after 80 heats. We believe, however, that we are gradually overcoming these troubles by decreasing the size of the uptakes and enlarging the slag pockets as mentioned above. Now only the fine particles are going to the checkers and are being blown off daily by compressed air. By this alteration we expect to get much longer life out of the checkers and consequently longer runs out of the furnaces. As a result of this continued development we believe that inside of six months we will obtain a 25 per cent. increase in production over the gas producer furnaces of the same size.

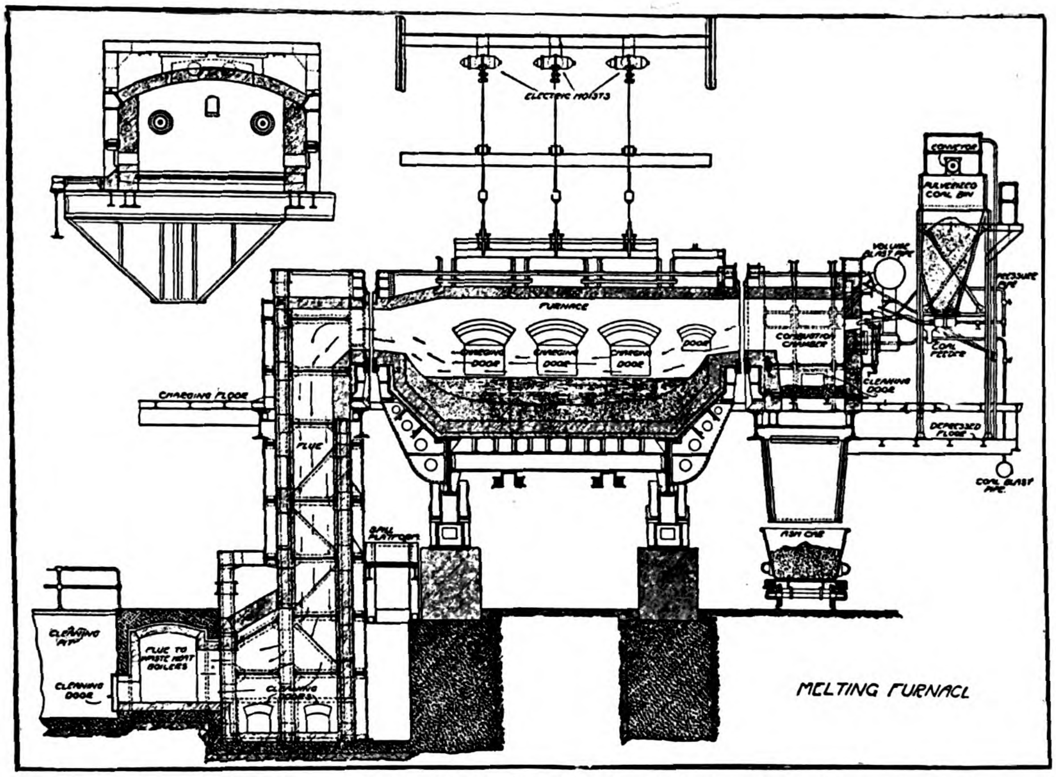


Fig. 4. Open Hearth Furnace Fired with Powdered Coal and Equipped with Waste Heat Boilers

"Sulfur does not give any trouble as long as there is a good draft and the furnace is working hot. We are now using coal with over 1 per cent of sulfur and getting good results. If checkers get clogged up, and the furnace begins to blow, due to lack of draft, we have trouble with the bath taking up sulfur. The furnace is under complete control of the first helper as to amount of coal being used, as well as air blast and temperature. The flame using the same coal as gas producer is hotter, which allows us to use a greater percentage of scrap per ton of steel, thus reducing the consumption of high-priced pig iron; also it enables us to obtain a greater number of heats per week.

"The finished steel is quieter in the moulds, due to not being over-oxidized, as the coal coming directly in contact with the bath has a greater reducing action. We feel reasonably certain that the oxidation losses are less with pulverized coal than with producer gas. All-gas house troubles are eliminated (clearing fires, burning out flues, etc.), although the pulverizing plant must be given attention as to dryness and fineness. Refractory costs have been greater on the furnace using pulverized coal than on gas producer furnaces. I believe, however, than our steadily increasing familiarity with the use of the fuel will enable us to reduce this item nearly to the corresponding cost in producer gas furnaces."

At the basic open-hearth furnaces of the National Malleable Castings Company, Sharon, Pennsylvania, pulverized coal has been used in place of fuel-oil without any sacrifice on tonnage or quality of product in any way and with very gratifying economies. This plant was the pioneer in firing basic open-hearth steel furnaces with pulverized coal, and it has operated successfully and continuously since 1914. Fig. 4 shows an open-hearth steel furnace fired with powdered coal and equipped with waste heat boilers.

The melting of iron by the use of powdered coal in the air furnace for the manufacture of malleable castings was successfully accomplished in 1914. Fig. 5 is an illustration of this. A number of installations have been made in the last few years, which have conclusively demonstrated that there is remarkable economy and convenience in the powdered fuel method as compared with the previous hand-fired method.

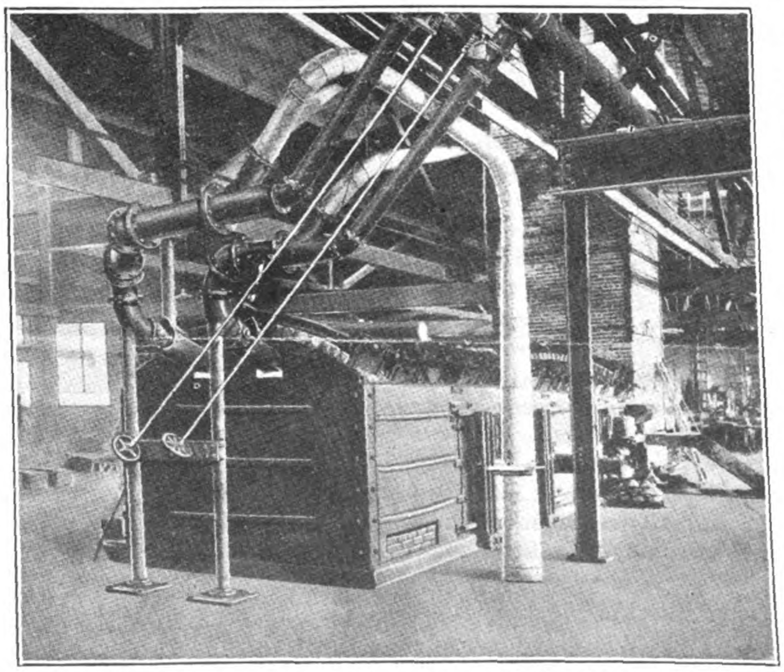


Fig. 5. Furnace for Melting Iron with Powdered Coal (The Holbeck System)

According to F. P. Coffin* of the General Electric Company, Schenectady, New York, the advantages derived in melting iron for malleable castings with powdered coal, as compared with hand-firing, are as follows: "(1) Increased economy. The ratio of coal to iron in hand-firing, under the best conditions, was not over 1 to 2.5, while with pulverized coal the ratio is 1 to 4.5.

"(2) Owing to complete control of melting conditions

* "Pulverized Coal in the Iron and Steel Industry"—*Chem. & Met.* Vol. 25, No. 21, pp. 971-973.

and of the speed of operation the heats may be tapped at exactly the time set in advance. This does not vary more than five minutes from day to day.

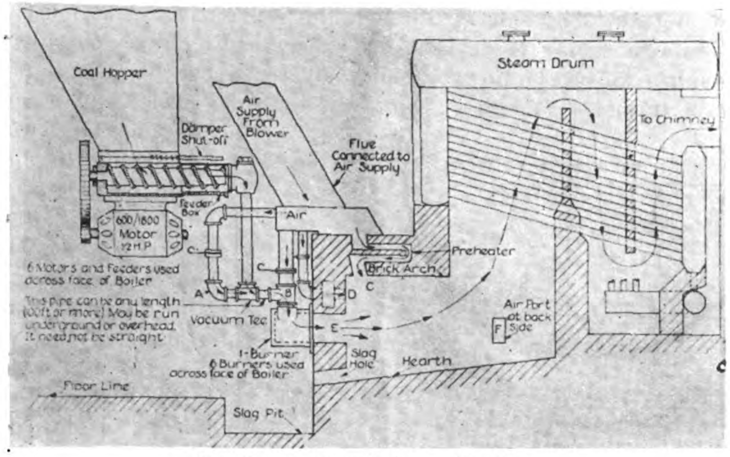


Fig. 6. Sectional View of Boiler

(3) A hotter and more fluid iron is obtained, which is very desirable in malleable iron practice. This cuts down the losses from misrun castings.

(4) Cost of repairs to the furnace has been reduced approximately 5 per cent.

(5) The labor saving in running the furnace is about 1½ m.m.

"A comparison of the operation of the furnace with hand-firing and with powdered coal is as follows :

	Hand-fired Coal	Powdered Coal
Air pressure at furnace—oz.	2.5	0.8
Diameter of main blast pipe—in.	1.8	15.0
Vol. main blast—cu. ft. per min.	3500.0	3500.0
Time of melt—hrs. hot furnace	5.5	3.8
Time of melt—hrs. cold furnace	7.0	5.0
Coal per ton of iron melted—lb.	940.0	600.0

PERCENTAGE OF SAVING

Coal	31%
Pig iron replaced by scrap	18%
Time of melting	30%
Labor	60%
Skimming bars	30%
Cost of repairs	29%

"In comparing the pulverized coal-fired furnace with the hand-fired furnace there are a number of other outstanding advantages which cannot be expressed in figures. These have been summed up as follows: (1) Less slag to dispose of, including all melted ash. (2) Practically no ashes to dispose of. (3) No cleaning of clinkers from the fire-box. (4) No grate bars, no top blast. (5) No smoke at any time. (6) More uniform analysis of castings. (7) Cleaner furnace surroundings. (8) The work is easier on workmen as there is less poking, leveling, and skimming, thus making them more satisfied. (9) Decreased oxidation of the metal."

During the present coal strike in the United States those malleable foundries having pulverizing plants are using a poorer grade of bituminous coal (ash 17 per cent.—sulfur 2 per cent.) because good coal (ash 6 per cent.—sulfur 7 per cent.) is not available. The results obtained are very satisfactory. Only a slight change in the furnace condition is necessary, that is changing the velocity of the draught. Thus it is demonstrated that powdered coal has a distinct advantage in time of emergency.

Success and high efficiency are also attained in the application of powdered coal to the non-ferrous, metallurgical industry. In this industry alone are used from 1,000,000 to 2,000,000 tons of pulverized coal per year. Copper smelting reverberatory furnaces, ore roasting and smelting furnaces, ore melting and reducing furnaces, copper melting furnaces, and brass melting furnaces, are among some of the furnaces in which powdered coal has been successfully applied.

In the reverberatory furnaces for melting copper and other ores, powdered coal has been used very successfully in a number of plants, both in the United States and Canada. In the plants of the International Nickel Company and the Tennessee Copper Company the installation of powdered coal firing in place of hand or grate-firing has shown the following advantages :—

(1) Increased production. Powdered coal firing in one reverberatory furnace smelted 14,272 tons in 1,985 tons of coal per month, while grate-firing in another reverberatory furnace smelted only 7,260 tons with 1,871 tons of coal for the same length of time.

(2) The charging action is continuous; there are no stops for grating ; as the charge in the furnace smelts and runs away, more ore at once comes down from the hopper.

(3) Efficiency is much higher, due to (*a*) Uniform and steady generation of heat; (*b*) complete and rapid combustion at all times; (*c*) combustion taking place where heat is most wanted.

(4) Savings resulted from using cheaper grades of coal; coal containing as high as 17 to 22 per cent. of ash has been successfully used, whereas in grate firing this is impossible.

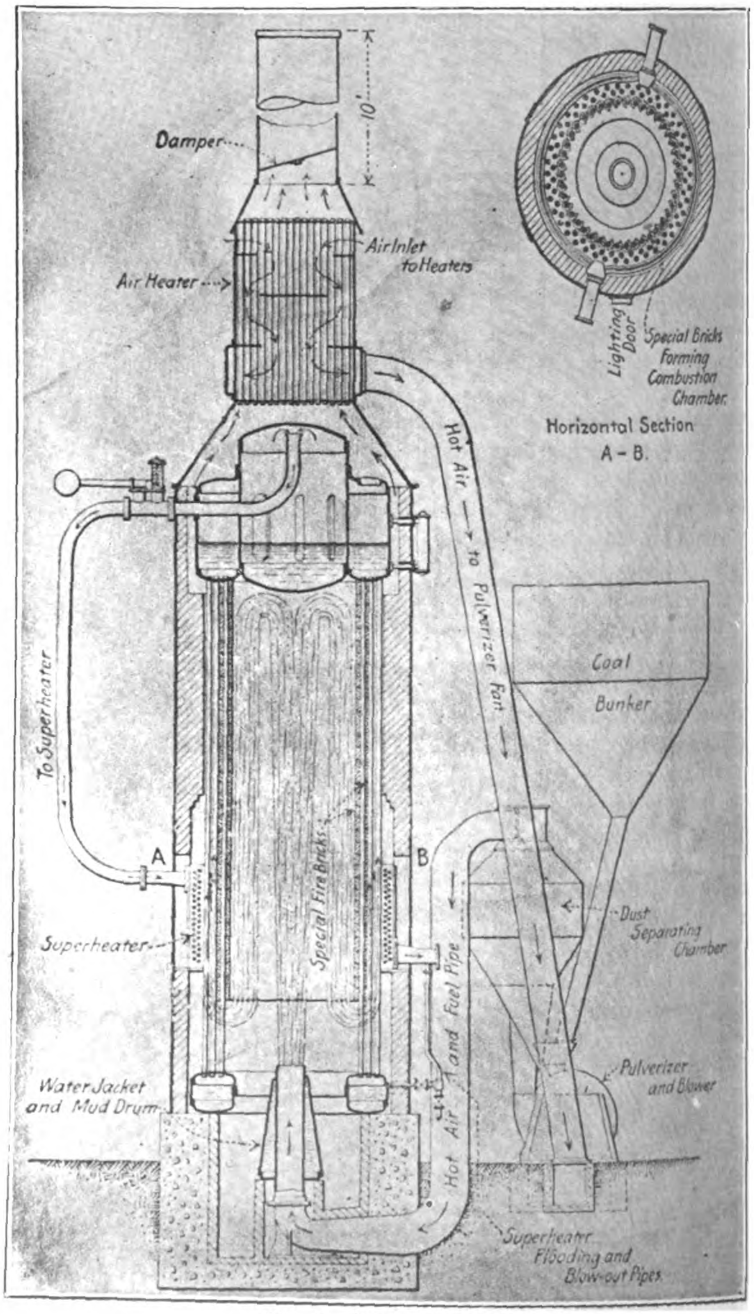


Fig. 7. Bettington Boiler

(5) Flexibility and ease in controlling the flame condition and temperature, which means simplicity and ease in operating the furnace. Furnace firing is controlled by regulating values.

The application of powdered fuel for steam boilers has for many years been uppermost in the minds of engineers and boiler users. They have realized the many advantages and great possibilities in this enormous field. There are records of a number of old, isolated applications of powdered coal to boilers, but it has been only within the past six years that fuel in this form has been accepted by large industrial plants and public utilities for steam generation. The mechanical stoker is now having a keen competition, and it will not be surprising to see the superiority of the new method of firing boilers in the next ten years.

The difficulties first encountered were due largely to incorrect furnace design, not only as regards the general form, but also in regard to the proposition of meeting load conditions, characteristics, and analyses of fuel. The earlier trials were made with bituminous coal, and as the general knowledge of the subject became available, larger projects were undertaken, until at the present time there are a number of plants, such as The General Electric Company, The American Locomotive Company (both at Schenectady, New York), The Milwaukee Electric Railway and Light Company (Wisconsin), and The British Columbia Sugar Refining Company (Vancouver, B.C.), which are of sufficient size and importance, burning pulverized bituminous and anthracite coal and lignite, to furnish a good comparison with similar stations equipped with the stokers.

Fig. 6 shows how the powdered coal equipment was installed at a boiler in the Schenectady works of the General Electric Company.* The boiler was a 500 h.p. Munoz type. A substantial saving was effected in the fuel bill. Efficiency of seventy-five per cent. can be obtained without an economizer.

Fig. 7 is an English type of boiler, designed especially for the use of powdered coal, by Claude Bettington of Johannesburg, South Africa. The flame is projected vertically upward in a brick-lined combustion chamber, surrounded by a circle of vertical tubes. The bricks are cooled by radiation to the tubes. The air is preheated, and a small pulverizer is connected to the tuyere, without intermediate storage for powdered coal. Several of the boilers have been successfully used in South Africa, in Great Britain, and in Canada.

As a result of careful testing and comparison it has been demonstrated that powdered coal for steam generation has the following advantages over the modern stoker boiler plant.†

"(1) Much wider variation in the quality of the coal usable is obtained when coal is burned in pulverized form. All grades of coal are being burned in pulverized form with economy. No stoker will satisfactorily handle all grades of coal. Therefore the use of pulverized coal largely overcomes most troubles due to poor coal, and it is particularly desirable for this reason alone.

(2) The ability to take care of peak loads. In other words, a pulverized coal burning system is much more flexible than a stoker installation. Its flexibility approaches that of fuel oil or natural gas.

(3) By throwing a switch the entire firing operation ceases, an advantage in case of accident or emergency.

(4) Ash is in much better condition to handle. The ash is in the form of dust or slag, depending upon the melting point. This helps to maintain constant furnace temperature, as there are no interruptions in firing conditions on account of cleaning fires.

(5) There are no grates to clinker, particularly after operating at a maximum rating.

(6) Pulverized coal is fired dry, containing less than one per cent. of free moisture, whereas coal burned in stokers may vary in its content of moisture, anywhere from one to ten per cent. of free moisture as fired.

(7) Considerably less excess air is used for complet ecombustion. Less excess air means less power for furnishing air supply, particularly where forced draft is used. With less excess air the stock losses are less. Lower grades of coal fired on stokers require more excess air it is quite difficult for the oxygen to get in close contact with the combustible. An air supply sufficient to furnish all the air for combustion should be available, although at times only fifty per cent. of air need be injected into the furnaces with the coal, the balance being supplied by the induction of action of the burner, or being drawn in by the stack draft. The air going into the furnace should be under control to permit close regulation under all conditions of firing. Less draft is required for pulverized coal furnaces.

(8) All combustibles in the coal are consumed when it is burned in pulverized form, provided the furnace capacity is not exceeded. None of the combustible goes out into the ash pile, and therefore fires in the ash pile are eliminated.

(9) There is less corrosion from sulfur on the boilers, due to less moisture in the coal as fired; therefore high sulfur coals can be burned more rapidly without serious results.

(10) With furnaces properly proportioned and with properly designed burning equipment, smokeless operation has been maintained indefinitely. This is due to the complete combustion of all the particles of coal before they come in contact with the cold surface of the boiler.

(11) Less refractory troubles have developed due to more uniform furnace temperature conditions.

(12) Steam may be gotten up quickly. In a 400 h.p. rust boiler with cold setting, with feed water about 130 F., steam was raised to 150 pounds, and the boiler cut into line in forty-five minutes. The boiler furnace in which this test was made was only figured for normal rating; the rapidity of firing with pulverized coal equals that of any other fuel."

The burning of powdered fuel has been equally successful in boilers of steam locomotives. The early experimental stage is now passed, and several large railway companies have equipped their locomotive boilers with powdered fuel firing. In the United States installations have been made on the Chicago and Northwestern Railway, the New York Central, and the Delaware and Hudson Railroad. In Brazil, South America, the Central Railway of Brazil has equipped its locomotives for burning powdered coal. In all the applications a double advantage is gained, namely, a method of mechanically stoking a locomotive, and a method of utilizing low-grade fuel which can be had at any place. As a mechanical stoker its only competitor is oil firing, and oil is a high-grade fuel which cannot be had very readily in certain parts of the country.

Mr. F. P. Coffin‡ gave as advantages which powdered coal shares with oil, the following:—

(1) Hand labor is eliminated for firing.

(2) The fire is easily regulated.

(3) Less time is required for raising steam from a cold boiler.

(4) There is less back pressure in the cylinders, due to increase ofarea of exhaust nozzle, strong suction not being required to draw air through coal on the grate.

(5) Less time is required for cleaning fires.

(6) There is freedom from smoke, cinders, and incendiary sparks, which cause fires along the right of way.

(7) More fuel can be burned per hour, hence the engine can do more work.

According to C. F. Herington§ powdered fuel has succeeded because of the following advantages:—

"(1) It offers opportunity for even greater accomplishments in the steam railway field than have heretofore been obtained through use in cement kilns and in metallurgical furnaces.

(2) It produces a saving of from fifteen to twenty-five per cent. in coal of equivalent heat value, as compared with hand firing of

* "The Use of Low-grade Fuels and the Status of Powdered Coal" by F. Parkman Coffin. *General Electric Review*, Vol. 20, No. 8, pp. 606-631.

† "Powdered Coal as a Fuel" by Herington, D. Van Nostrand Co., N.Y, 1920, pp. 256-259.

‡ "The Use of Low-grade Fuels and the Status of Powdered Coal" by F. Parkman Coffin, *General Electric Review*, Vol. 20, No. 8, pp. 606-631.

§ C. F. Herington—"Powdered Coal as a Fuel"—p. 162, D. Van Nostrand Co.

coarse coal on grates. Powdered coal may run as high as ten per cent. in sulfur and thirty-five per cent. in ash, and still produce maximum steam heating capacity ; thus otherwise unsuitable and unsalable or refuse grades of coal may be utilized, and hence the saving cost per unit of heat evolved will be a considerable item.

(3) It enables us to maintain fire-box temperatures and sustained boiler capacities equivalent to and exceeding those obtainable from crude or fuel oil.

(4) It maintains the steam locomotive on its present relatively low first cost and expense-for-fixed-charge basis and further reduces the cost of maintenance and operation of large units.

(5) It eliminates the waste products of combustion and fire hazards, and permits the enlargement of exhaust steam passages, thus producing increased efficiency in the cylinders."

With the rapidly decreasing coal supply, the enormous amount of waste, the inconvenience of hand-firing, etc., it can readily be seen that the efficient utilization of fuel supplies is undoubtedly a subject of paramount importance. All the testimony just given shows that America has derived great benefit from employing methods for more efficiently utilizing her fuel resources. The art of burning coal in pulverized form is but another addition to her national security and prosperity. as a result of the satisfactory experiments in America the new art of burning coal has made such a healthy development that it is being recognized, more and more, the world over, as the most promising method of utilizing fuel in the industrial heating operations of the day.

Following the lead of America, England and Canada have spent much time and money in investigating the possibilities of pulverized fuel, and are equipping their industries and municipal lighting and power plants with powdered coal system. Likewise France has installed several large plants for use in metallurgical industries and under boilers, with excellent results. Inspired by the example of larger countries Italy and Belgium, after sending several engineering committees to the United States to investigate the advantages of powdered coal and the success ascribed to it, are convinced of its practicability. Several South American countries, after considerable investigation, are adopting pulverized coal in their industries, chiefly in railroad transportation, and in metallurgical works.

In contrast to the foresight of the countries just mentioned, those of the Far East, China in particular, have done little to provide for the conservation of natural resources. These countries, with their huge populations and their rapid development in industry and commerce, must economically utilize their fuel and other natural resources. Consequently anything that can be done to increase the efficiency of generating heat and power from coal, or economically curtailing the use of fuel-oil (which is costly and is imported annually in large quantities), by the substitution of powdered coal, should be immediately attempted. In view of the purpose of this article, the following table sets forth concisely the advantages of powdered coal :

TABLE

Savings Possible	Other Advantages
(1) Fuel—20-50%	(1) No smoke nuisance.
(2) Labor—25-75%	(2) Flexibility of operation and control.
(3) Oxidation loss—40-75%	(3) More perfect combustion.
(4) Furnace repairs—25-60%	(4) Utilization of low-grade solid fuel.
(5) Disposal of ash—50-75%	(5) More uniform heat.
(6) Grate bars and firing tools—100%	(6) Increased production.
	(7) Cleaner furnace surroundings.
(7) Kindling wood—90%	(8) Automatic handling of coal.
	(9) Boon to the workmen.
	(10) Requirement of less expensive stack.

Chinese-American Co-operation

Buying German Telephone Instruments

IN contrast to the success attained by Japanese-American co-operation in the manufacture of telephone apparatus, is the somewhat doleful story attending co-operation of the same American company with Chinese. Although the Chinese government through the ministry of communications have subscribed to twenty-five per cent. of the shares of the China Electric Company (a combination of the Western and Nippon Electric Companies), it is now reported as specifying German telephones in recent tenders. The situation as reported, shows that the China Electric Company having many accounts overdue have insisted upon cash with all new government orders, and the government, in return for long-term payments, have rejected their own industry and specified to German instruments.

In present tenders for the supply of Chinese government telephones and accessories, delivery is specified not in Shanghai or in any of the ports, but at the actual place of installation, calling for the addition of customs duties, government railway freight charges, and the shipper to be responsible for damage and theft in transit. Under the present conditions in China, it is difficult to get foreign firms to comply with these terms.

Governmental Telephones in China

TELEPHONE systems installed by and operated under the auspices of the ministry of communications in China are as follows :

Harbin (Kirin)	Ashiho (Kirin)
Taonan (Fengtien)	Kweiyang (Kweichow)
Fulungchuan (Kirin)	Changling (Kirin)
Itung (Kirin)	Shasi (Hupeh)
Kirin (Kirin)	Changchun (Kirin)
Shwangchen (Kirin)	Chefoo (Shantung)
Taiyuan (Shansi)	Changchow (Honan)
Kingchow (Hupeh)	Yangchow (Kiangsu)
Soochow (Kiangsu)	Wuhu (Anhwei)
Kiukiang (Kiangsi)	Shanghai (Kiangsu)
Nanking (Kiangsu)	Pukow (Kiangsu)
Chinkiang (Kiangsu)	Tanku (Chihli)
Hankow (Hupeh)	Wuchang (Hupeh)
Hanyang (Hupeh)	Peking (Chihli)
Tientsin (Chihli)	Paoting (Chihli)
Tunghsien (Chihli)	Lungan (Szechuan)

The following are private telephone companies, which have been registered with the ministry of communications :—

Kao-yang Telephone Co.			Kao-yang, Chihli.
Ho-chien	,,	,,	Ho-chien, Chihli.
Kiang-yin	,,	,,	Kiang-yin, Kiangsu.
Ta-chung	,,	,,	Nantungchow, Kiangsu.
Chang-shu	,,	,,	Changsu, Kiangsu.
Quinsan	,,	,,	Quinsan, Kiangsu.
Hsuchow	,,	,,	Hsuchow, Kiangsu.
Kiangsi	,,	,,	Nanchang, Kiangsi.
Hsia-shih	,,	,,	Haining, Chekiang.
Amoy	,,	,,	Amoy, Fukien.
Antung	,,	,,	Antung, Fengtien.

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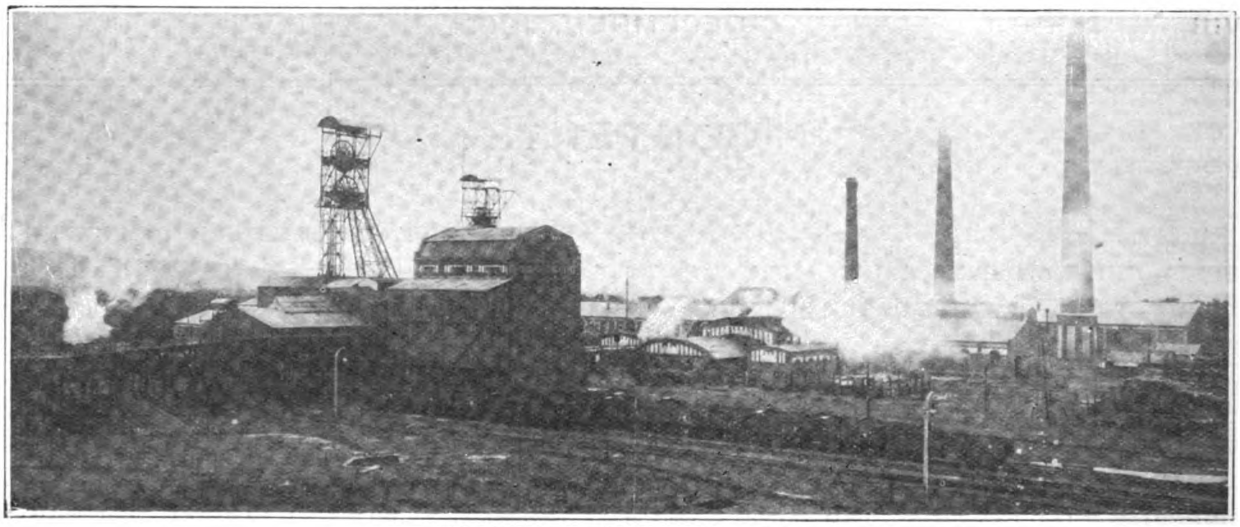

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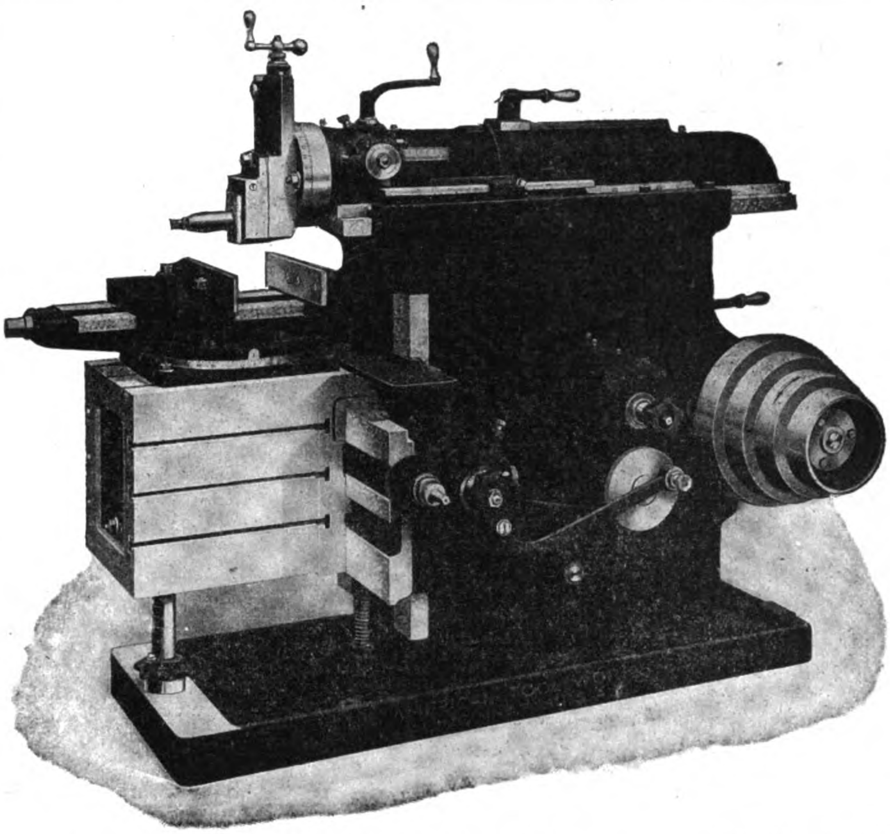

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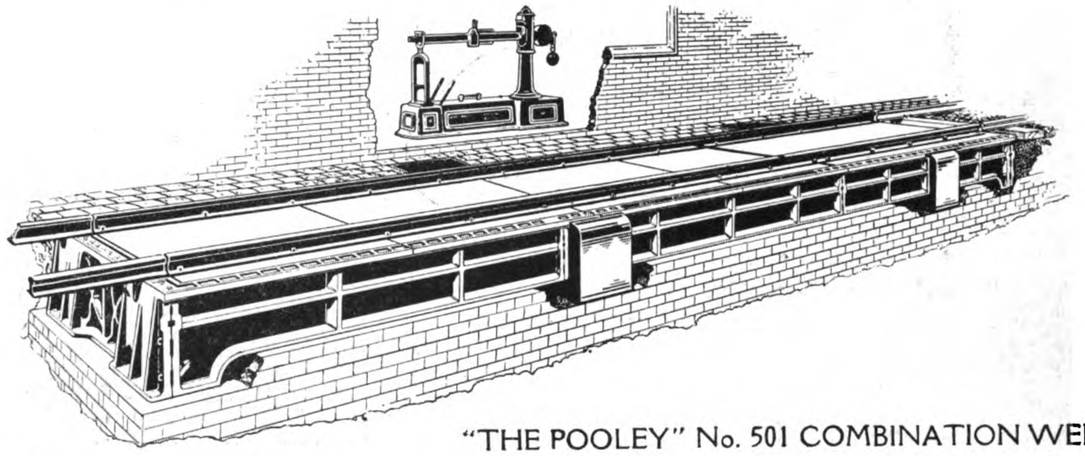

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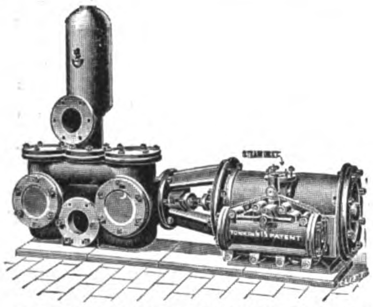

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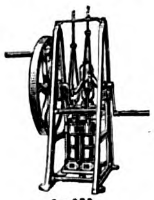
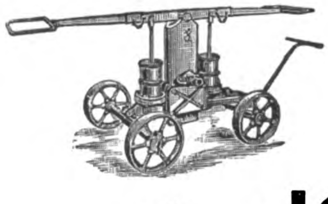
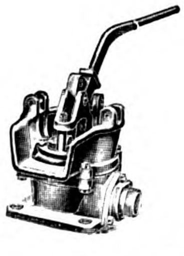
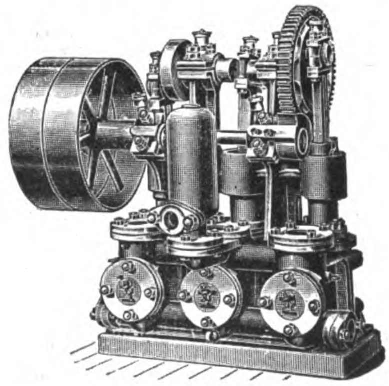


Fig.228.

Fig.160.







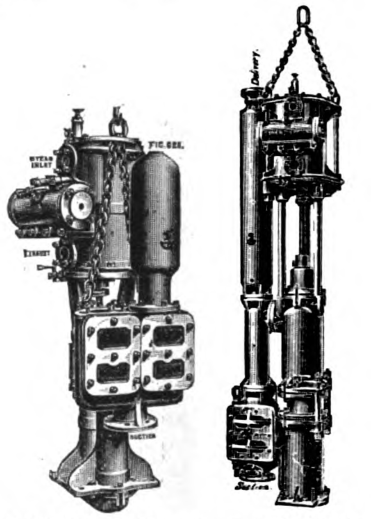


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Fig.191.

Fig.185.

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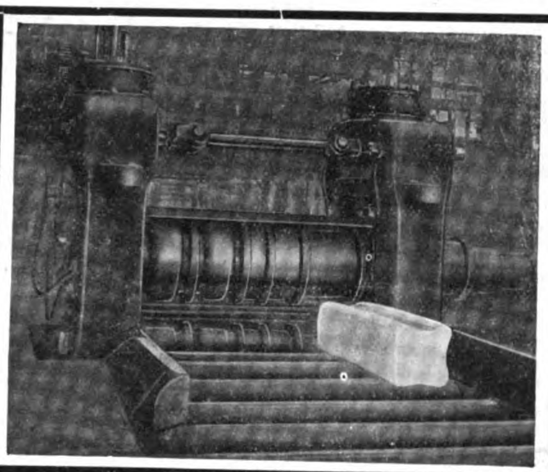

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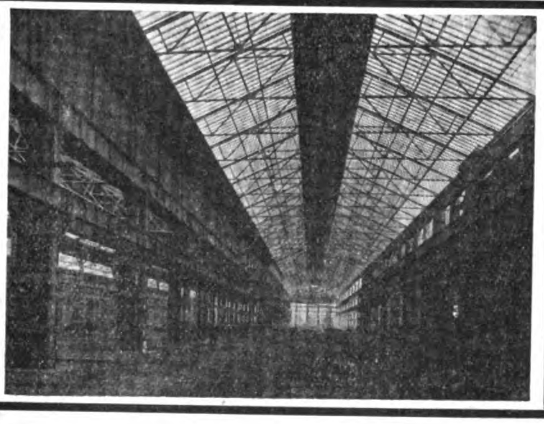

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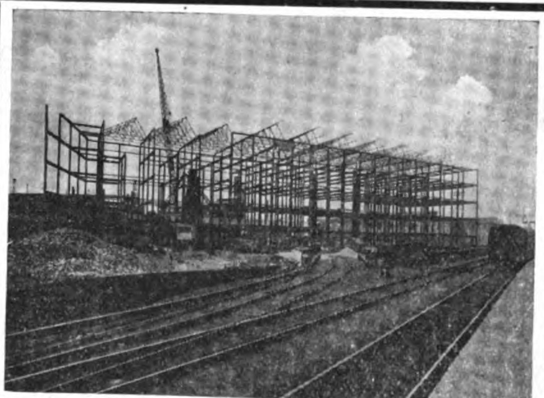

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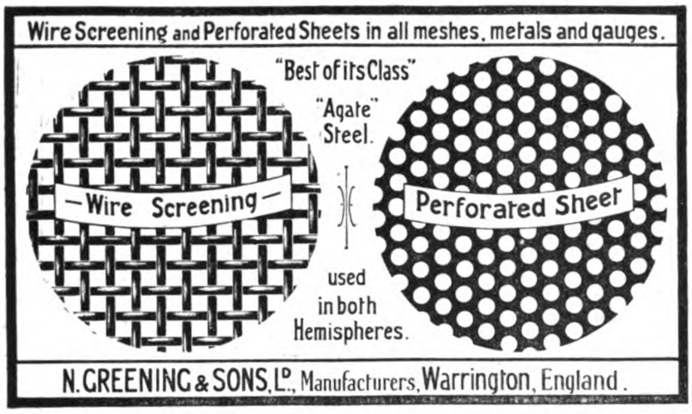

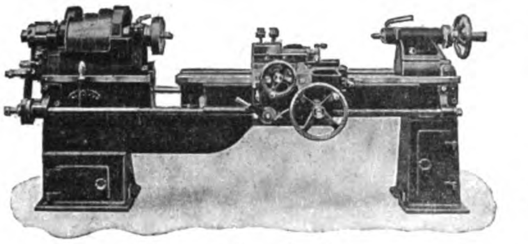

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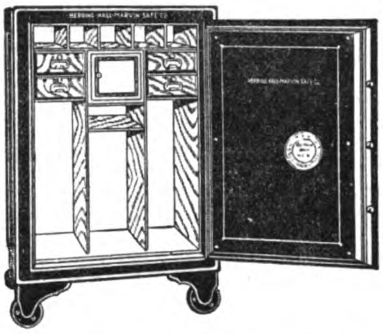

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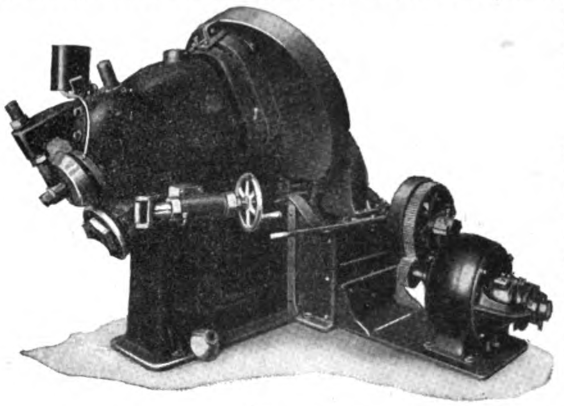

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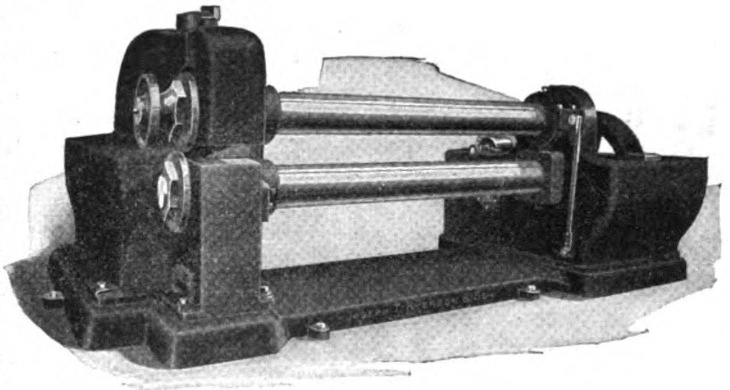

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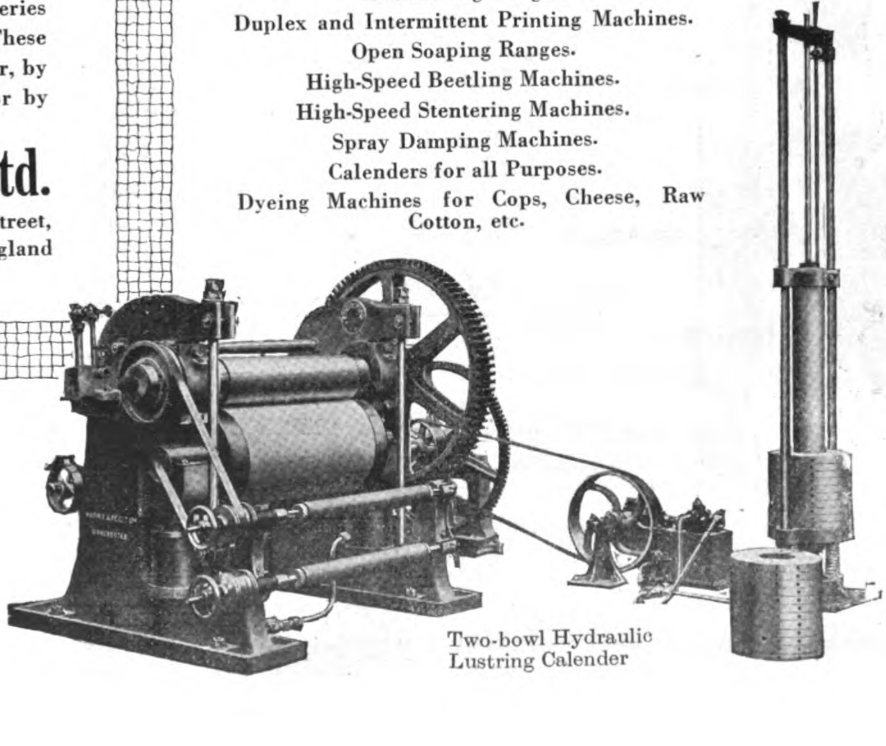

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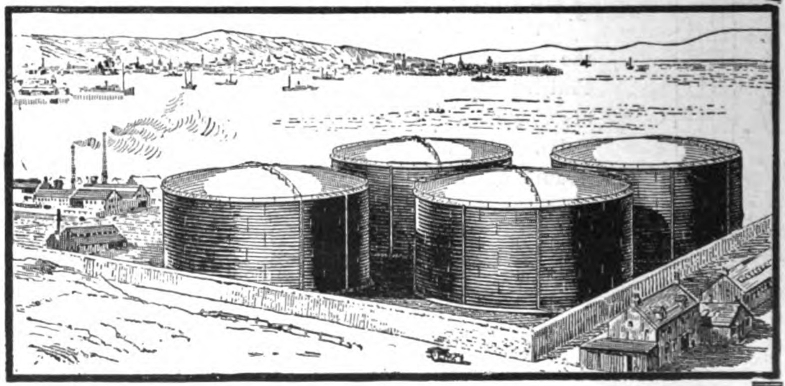

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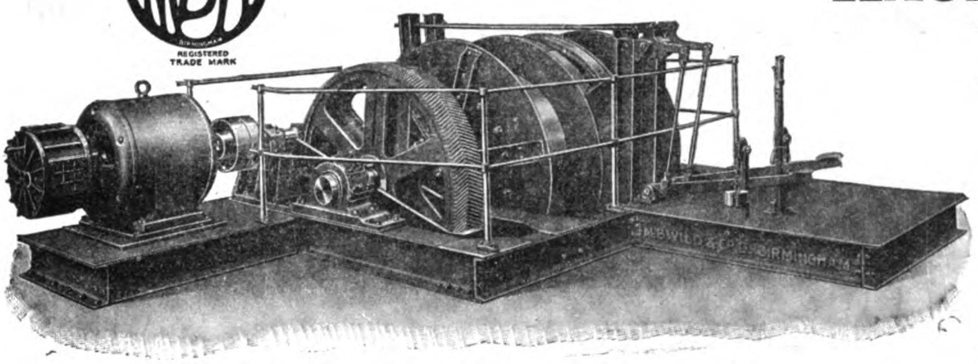

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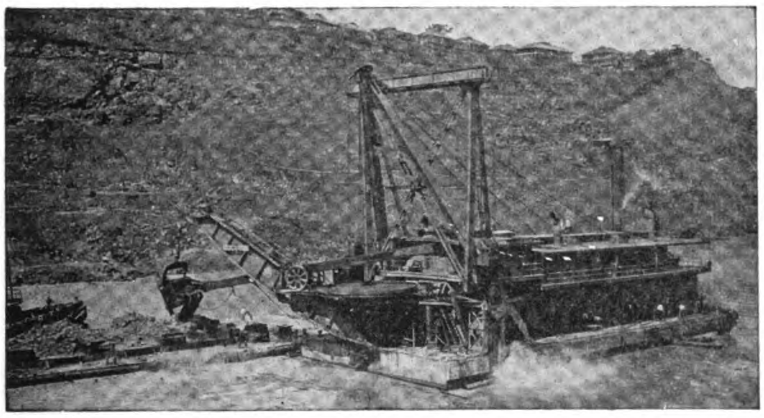

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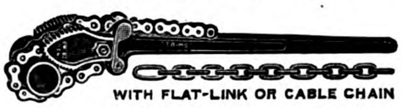

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PONGEES	BROCADES	SATINS
CREPES	SILKS	

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NEAR TOKYO
CABLE ADDRESS: "FUHO"

CAPITAL - Yen 38,000,000
OPERATING
450,000 Spindles and
1,775 Looms

Business Office:
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SILK AND COTTON YARNS, NOILS, etc.

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KANEGAFUCHI SPINNING COMPANY, LIMITED

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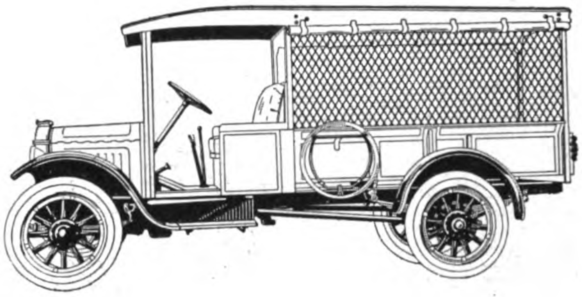

This light Republic Delivery Van is the latest type of commercial vehicle which fills the demand for quick service and capable of covering a large district.

Built by the largest organization exclusively devoted to the production of commercial vehicles, complete satisfaction is assured from correct design and the finest of materials.

Low first cost plus low operating expense guarantee profitable and reliable service.

There are Republic vehicles for every trade and all purposes.

Central Garage Co., Ltd.,
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Shanghai

REPUBLIC TRUCK SALES CORPORATION,
Alma, Michigan, U.S.A.
Cable Address : REPUBLIC

Humber

The High Average Car

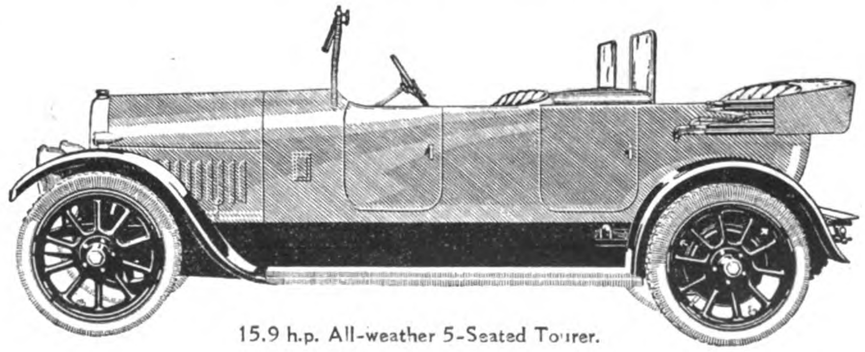
RIGHTLY acclaimed as "a model of luxurious comfort and superb refinement," the Humber 15.9 h.p. 5-seater Touring Car is indeed a triumph of engineering skill and accomplishment.

It is described by independent Motor experts as exactly what a 5-seated owner-driver's car should be in the matter of general arrangement and equipment of both chassis and body.

All Humber Cars are fitted with detachable steel Artillery Wheels suitable for all climates. All open models are fitted with the Humber All-weather Hood (with side curtains opening with the doors) which provides for complete protection even in tropical rains.

STANDARD MODELS.

11.4 h.p. 2-Seater (with double Dickey Seat)
11.4 h.p. Coupé (with double Dickey Seat)
11.4 h.p. 4-Seater 15.9 h.p. 5-Seater
11.4 h.p. Saloon 15.9 h.p. Saloon



15.9 h.p. All-weather 5-Seated Tourer.

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Works:
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Export Dept.:
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Associated British Machine Tool Makers, Limited.

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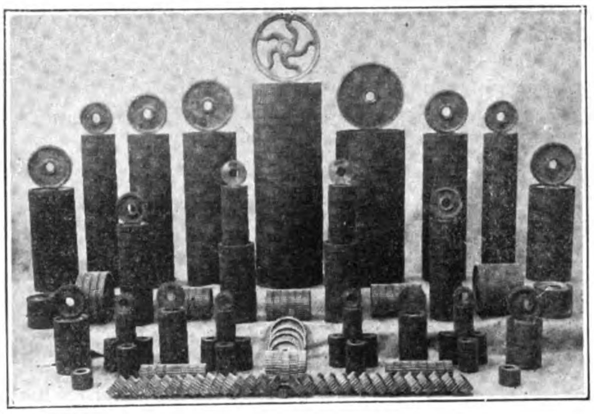

THIS TRADE MARK

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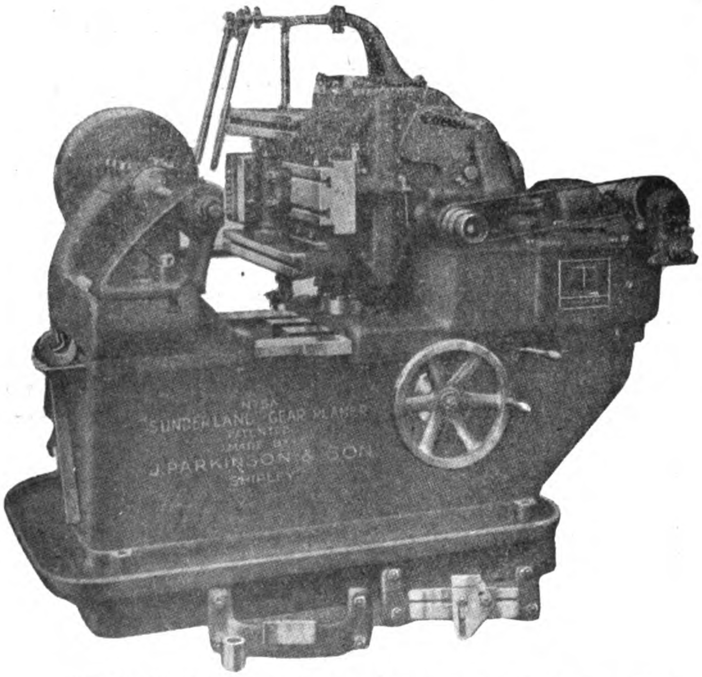

TEST MADE. 510 Wheels=25,500 Teeth in 19½ hrs. This equals an output of 220 Wheels=11,000 Teeth in 8½ hr. day, or 81-ft. of Tooth finished per hr.

No. of Teeth	No. Off	Total No. of Teeth	Time per Gear Including Mounting
100	30	3,000	3 mins. approx.
98	30	2,940	3 ,, ,,
76	30	2,280	2.4 ,, ,,
67	10	670	2.2 ,, ,,
63	60	3,780	2 ,, ,,
59	30	1,770	2 ,, ,,
50	10	500	1.7 ,, ,,
47	70	3,290	1.7 ,, ,,
42	60	2,520	1.7 ,, ,,
40	10	400	1.7 ,, ,,
34	40	1,360	1.8 ,, ,,
23	130	2,990	1.4 ,, ,,
Total	510	25,500	

SOLE AGENTS:

Jardine, Matheson & Co., Ltd.

CANTON	HANKOW	ICHANG	TIENTSIN
CHENGTU	HARBIN	PEKING	TSINGTAO
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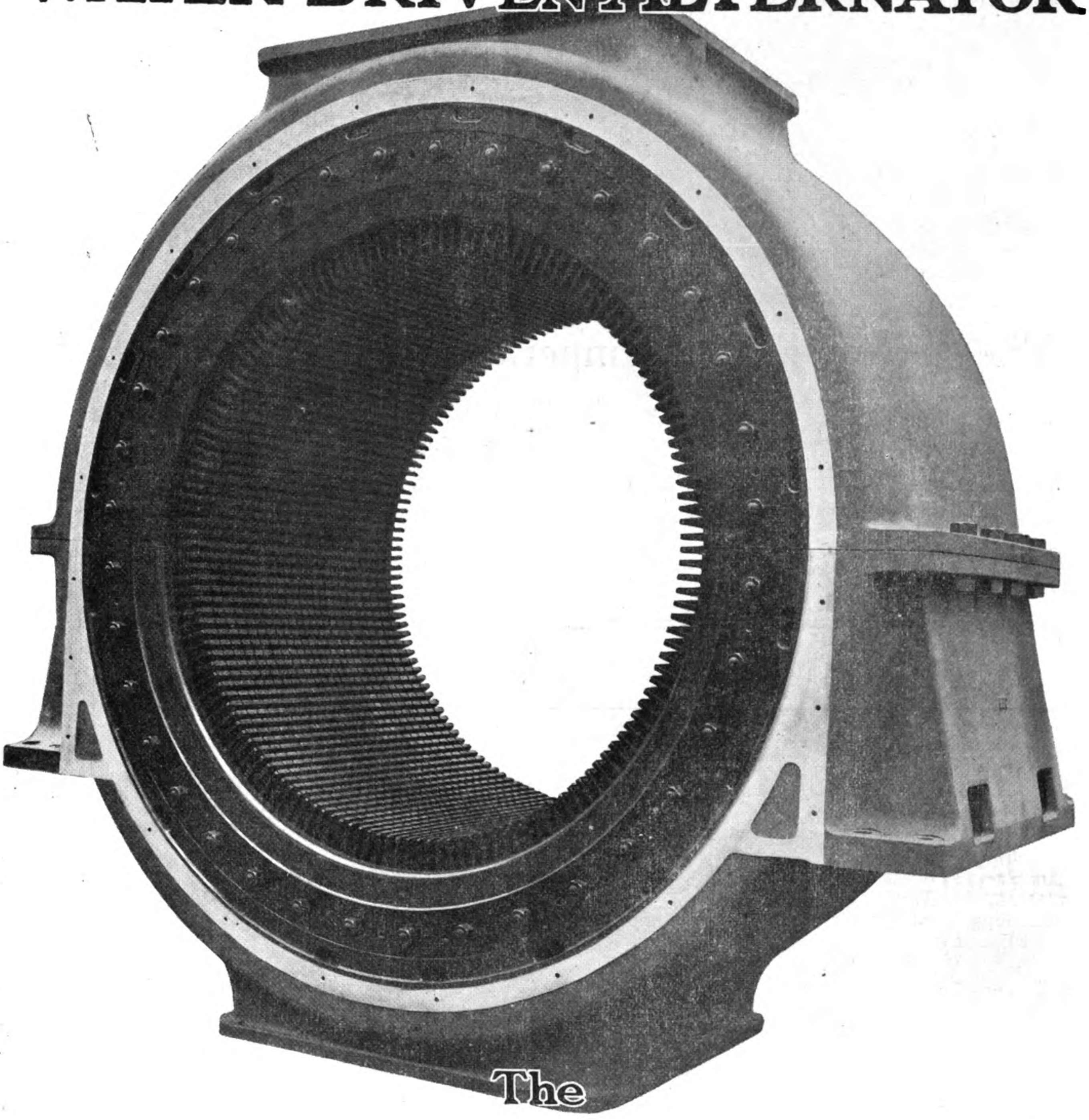
Bring Your Gear Cutting Problems to Us.

10,000 H.P.
WATER DRIVEN ALTERNATOR



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ENGLISH ELECTRIC
Company Limited.

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PHŒNIX WORKS, BRADFORD. SIEMENS WORKS, STAFFORD.
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HEAD OFFICE:-

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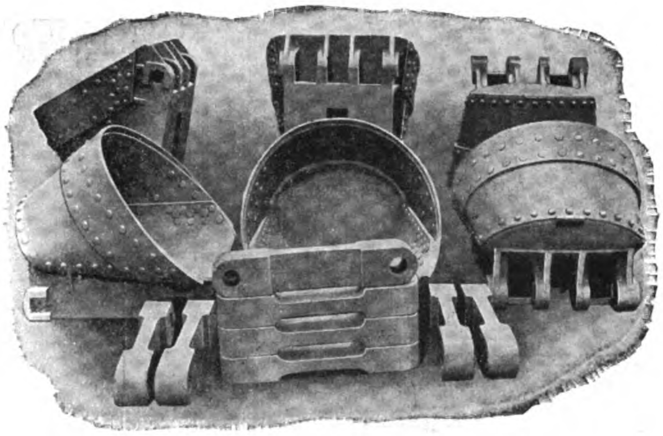
TELEPHONE — — — — — — — — — — — — HOLBORN, 830.

China Office: JARDINE, MATHESON & CO., LTD., Engineering Dept., 8a Yuen-Ming-Yuen Road, Shanghai
Japan Office: THE ENGLISH ELECTRIC CO., LTD., Yuraku Buildings, Marunouchi, Tokyo



"Imperial" Manganese Steel

"Imperial" Manganese Steel, whether used for the lips of dredger buckets, the bucket chain links, pins or bushes, means fewer stoppages due to breakage or rapid wear. As an example, the following extract from a letter may be quoted: "Up to the time I left West Africa the three bucket dredgers (gold dredging)

did not break a pin.

One dredge has been at work nearly two years, and the other two six months. I think the wear of the pins constitutes a record." What would a record like that mean to you in money saved?

The Makers of "Imperial" Manganese Steel

are

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and at
Hongkong, Hankow, Tientsin, Peking, Etc.

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Branch Office:

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2 Mitsu Bishi Buildings,
1 Yaesu-Cho, Kojimachi Ku,
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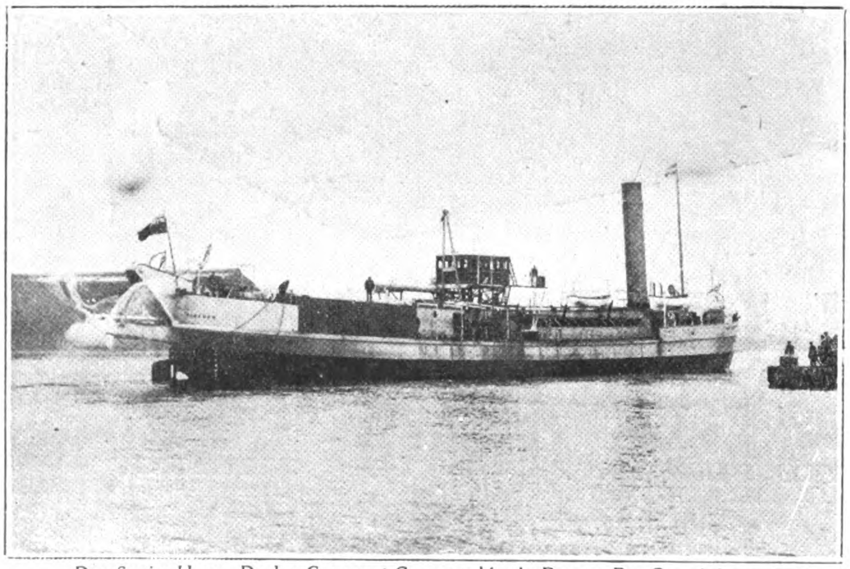
of most Modern and Improved Types and of the Greatest Capacities.

Constructors of Barge Loading, "Simons" Reclamation, Canal and Suction Cutter Hopper Dredgers. Hopper and Barge Loading Bucket Dredgers. Alluvial Dredgers. Trailing Suction Dredgers.



Drag Suction Hopper Dredger *Cormorant*, Constructed for the Rangoon Port Commissioners

Propelling and Dumb Hopper Barges.

Replace Parts supplied or fitted to existing Dredgers.

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Head Office and Works: Renfrew, near Glasgow.

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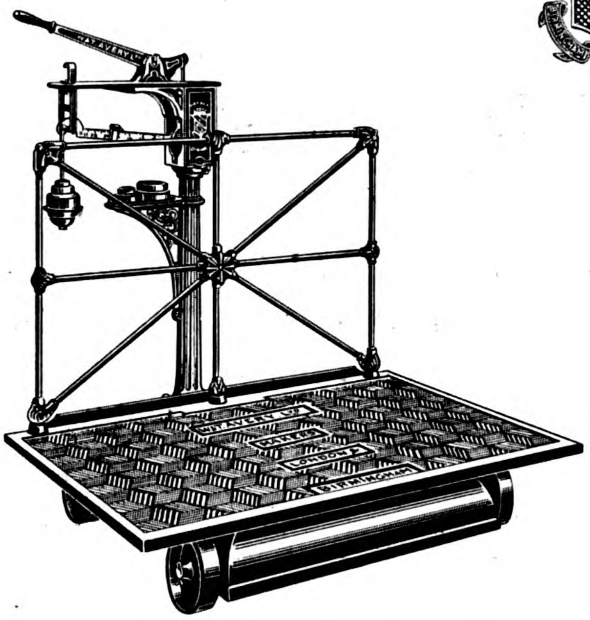

THE PARAMOUNT FACTOR IN ALL WEIGHING OPERATIONS, IS ACCURACY.

IT IS VITALLY IMPORTANT WHERE ESTIMATES OF VALUE, ARE DETERMINED BY WEIGHT.

LOSSES DUE TO UNRECORDED INACCURACIES ARE UNRECOVERABLE, THEREFORE THE VALUE OF ACCURACY IS INDISPUTABLE.

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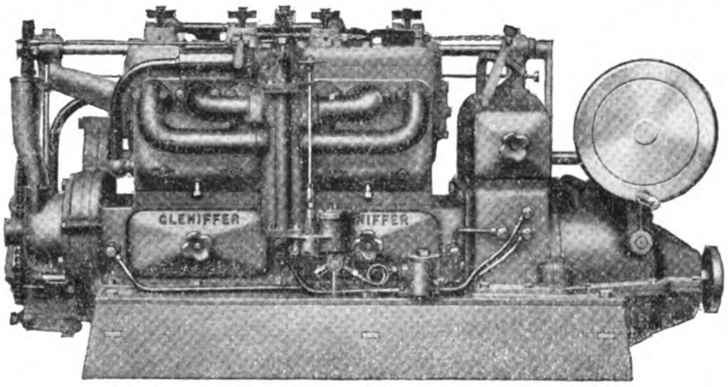

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The Corona Typewriter Co., Folding Typewriters.
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Asbestos Corrugated Roofing

Made of selected asbestos fibres and the best hydraulic cement, compressed into compact sheets under three thousand pounds pressure per square inch, Ambler Corrugated Roofing and siding cannot burn, rust, rot, split nor leak. Made in sheets twenty-seven and one-half inches wide with eleven complete corrugations, and in lengths of four, five, six, seven, eight, nine and ten feet to be applied directly on purlins with lead washers and either bolts or aluminium tie wires, furnished. This material is unaffected by heat or cold or climatic conditions. Send for our data sheets showing method of use. Address all inquiries to Export Department "B."

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Electrolytic Copper Ingots	20,000	Tons
Pig Iron	100,000	,,
Steel	50,000	,,
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COLLIERIES:

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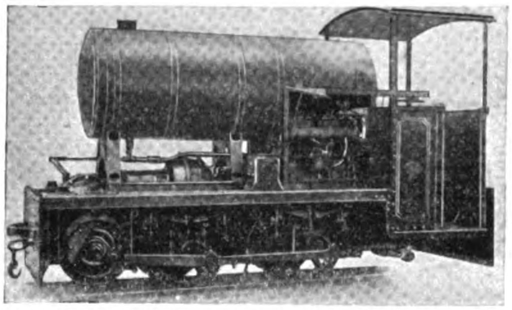

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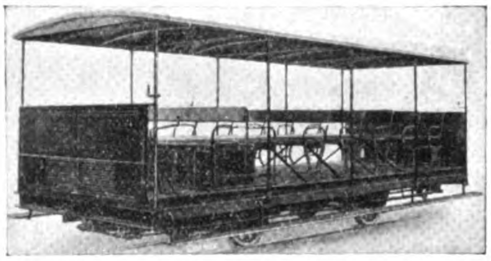

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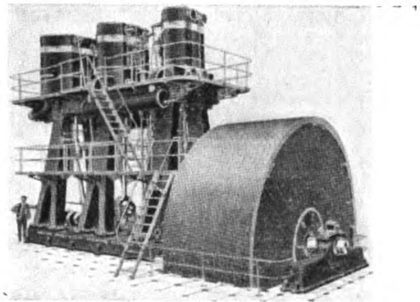

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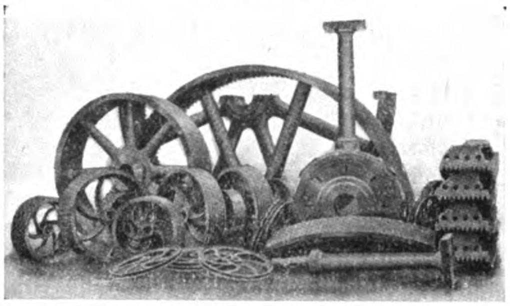

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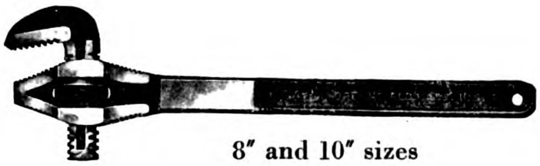
Little Giant—The New Pipe Wrench

14" and larger sizes



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A new design which gives increased strength, increased simplicity, increased usefulness, *less* weight, and fewer parts.

The "*Little Giant*" Pipe Wrench has become popular at once because of the end opening jaws. It can be thrust straight on a pipe like a pair of pliers, and will be found useful in places which are beyond the reach of an ordinary pipe wrench.

The arrangement of the jaw, which can be engaged at will with 2 or 4 sets of teeth on the handle can be seen in the picture. These extra sets of teeth mean long life. The "*Little Giant*" Wrench is drop-forged and heat-treated throughout.

Merchants will be particularly interested in the light weight (less than an ordinary pipe wrench) and the few parts. The "*Little Giant*" has only 3 parts, which means a smaller investment in replacements. Any of our representatives will be glad to quote prices.

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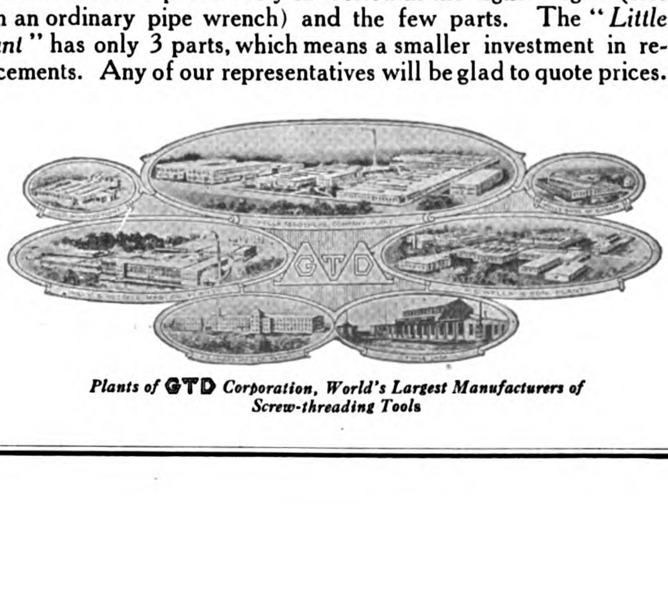

Plants of GTD Corporation, World's Largest Manufacturers of Screw-threading Tools

The Green Island Cement Co., Ltd.

SHEWAN, TOMES & CO.,

GENERAL MANAGERS, HONGKONG

Are You Going to Build?

Insist on your Architect specifying the use of the best brand of Portland cement in construction. If the house or factory is to be blocks or tiles, they should be of concrete, if stucco, only the best cement should be employed; if reinforced concrete is used, only a standard cement will stand the test; if your building is to be fireproof, waterproof, safe against earthquake or typhoon, improving with age, and lowering the cost of insurance, you must employ concrete, and the best concrete construction is only secured through the use of

Green Island Cement

Green Island Cement is supplied in Bags = 250-lbs. net, Casks = 375-lbs. net, Iron Drums = 375-lbs. net.

Also, Glazed Stoneware, House Drains, Sewer Pipes, and Fittings, Paving Bricks, Tiles, Fire Bricks and Fire Clay.

The Green Island Brand has become the standard Portland Cement of Asia, owing to its purity, uniformity and tests.

Used by H.B.M.'s Government in Hongkong, United States Government in the Philippines for all important Public Works.

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Manufacturers of Pure Manila Hemp Rope

Rope supplied to the British Navy on the China Station and to all Mail and regular Steamship Lines.

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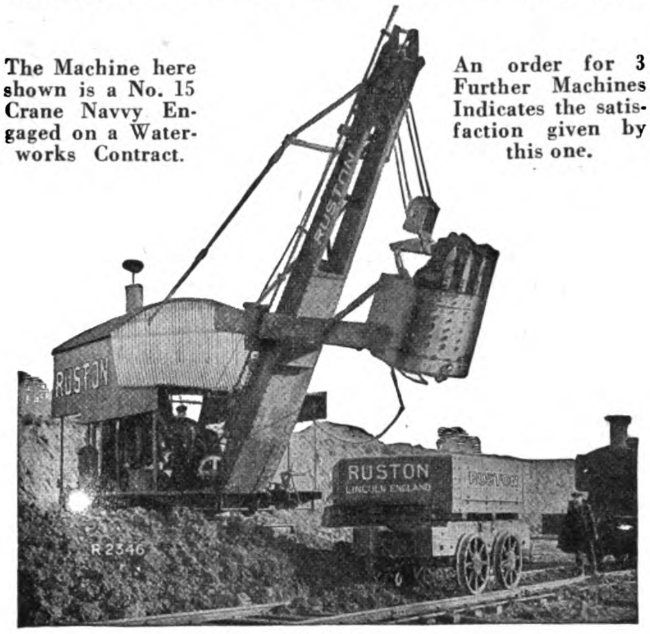
RUSTON EXCAVATORS—Crane Navvies Shovels, and Draglines have proved their efficiency on all classes of excavations in all parts of the world.

Wide Range of Machines available on Rail Wheels, Road Wheels or Caterpillar Tracks.

The Machine here shown is a No. 15 Crane Navvy Engaged on a Waterworks Contract.

An order for 3 Further Machines Indicates the satisfaction given by this one.



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OR

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ARNHOLD BROTHERS & CO., LTD., SHANGHAI.
UNITED ENGINEERS LTD., SINGAPORE.

The JANNEY-PENN Coupler

THE latest development of the Janney type of M. C. B. Coupling originally introduced and promoted by this company. This coupler has all the simplicity of the early type of the Janney coupler, and also has the up-to-date features of a "Lock-to-the-Lock," "Lock-Set," and a "Knuckle-Opener," and complies fully with all the requirements and recommendations of the M. C. B. Association of the U. S. A.

This coupler has the desirable feature of easy accessibility of parts, thus facilitating the making of repairs.

Furnished with various designs of rear end to suit different types of Draft Rigging.

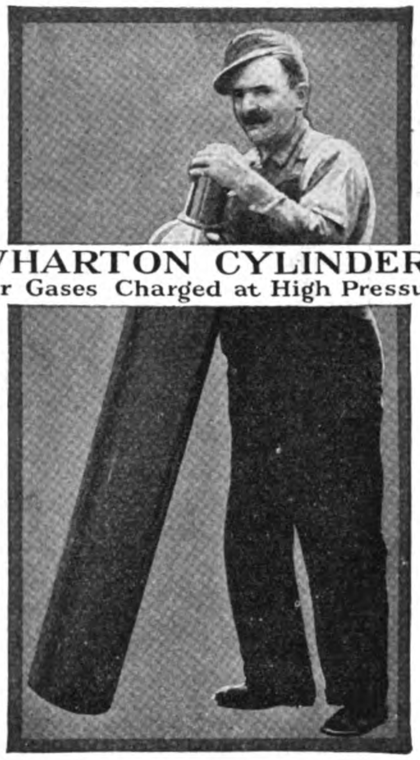
Manufactured exclusively by

THE McCONWAY & TORLEY CO.

Pittsburgh, Pa., U. S. A.

Cable Address—Torley, Pittsburgh

China Agents: The Fearon, Daniel Co., Tientsin, Peking, Hankow and Shanghai, China



Better than Requirements!

It is not sufficient that Wharton Cylinders merely meet standard British and American specifications—they have built into them safety and endurance factors beyond requirements.

They are made from Wharton Special Cylinder Steel *billets.* They undergo six rigid tests during the manufacturing process and a final hydrostatic test. We furnish official test certificates with them. They are furnished with or without caps and valves. Deliveries are prompt.

For oxygen, acetylene, hydrogen, carbonic acid, nitrous oxide, sulphur dioxide, liquid chlorine, blaugas, etc., they have no equal.

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The parent company—Taylor-Wharton Iron & Steel Co.—is 180 years old. It manufactures manganese steel frogs, switches, crossings, gears, pinions, dipper teeth, buckets, crushing and grinding machine parts, etc.

Representatives Desired for Wharton Cylinders

Concerns and individuals desiring to represent us are invited to write. Our facilities in manufacture and service, our reputation, stability and the worth of our product make this an unusual opportunity.

Wm. Wharton, Jr. & Co., Inc.

(Founded 1859)

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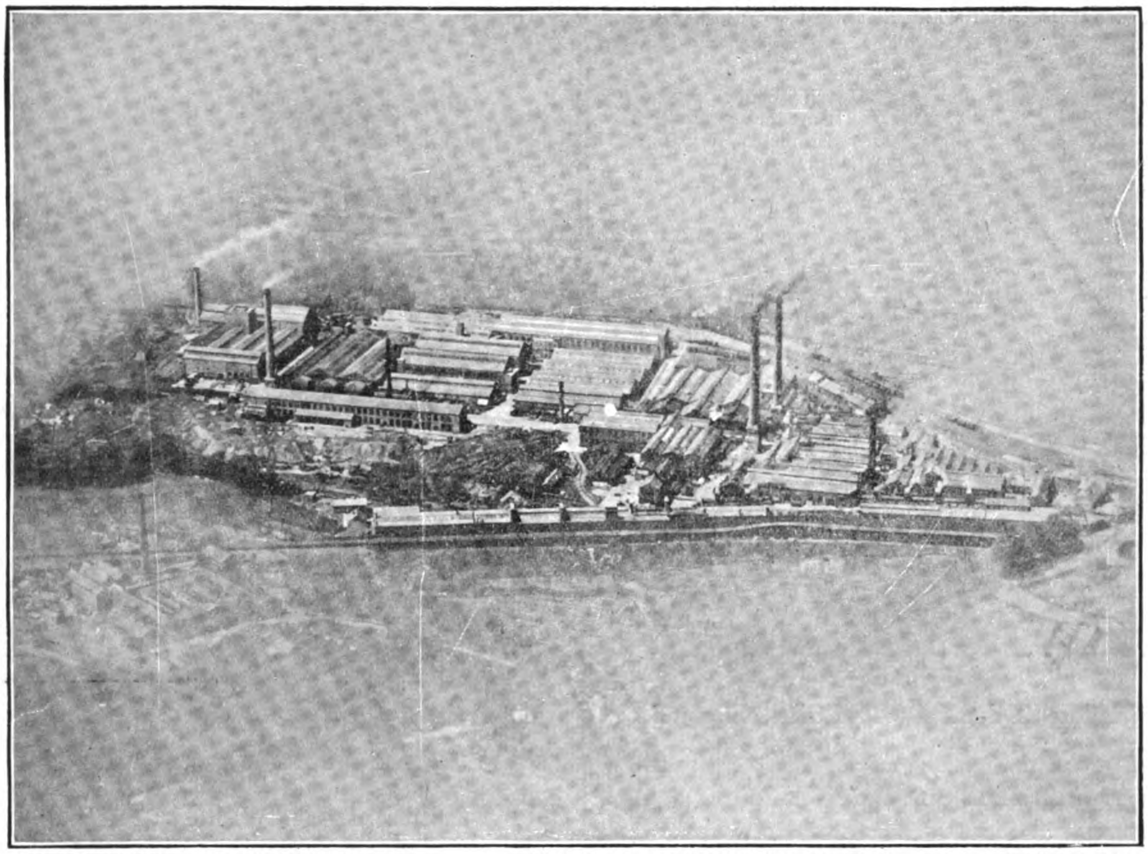
Cable, Wilwharton, New York



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These Works, belonging to the King's Norton Metal Co., Ltd., situated at Birmingham, form part of the Metal Section of Nobel Industries Limited.

For over thirty years this firm has been famous for the high quality of its metals. The new Rolling, Wire Drawing and Extrusion Mills are fully equipped with up-to-date plant for the production of all kinds of non-ferrous metals in strip, sheet, wire, rod, or section form. A considerable proportion of the metal so manufactured is worked up on the premises into finished or semi-finished products. Minting is one of the Company's specialities—large quantities of finished Coins being made for the Home, Colonial and Foreign Governments.

High quality is maintained by working to rigid specifications, by controlling manufacture at all stages by laboratory supervision, and by passing all products to an Inspection Department for examination prior to despatch.

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Write to the Advertising Department, Nobel House, for illustrated booklet "The Products of Nobel Industries, Ltd." mentioning this Journal.

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Billets
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Car Wheels
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Nail Rods
Nail Wire
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Piling—Steel Sheet
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The Combined Actual Annual Ingot Production of our Manufacturing Companies for the year 1920 was in excess of 19,000,000 tons.

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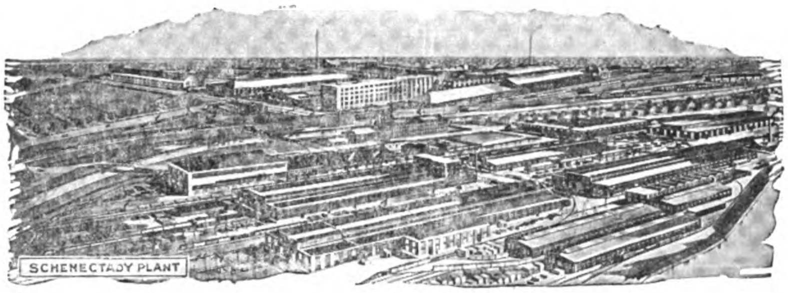
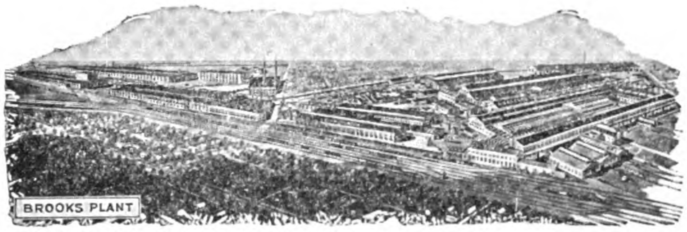
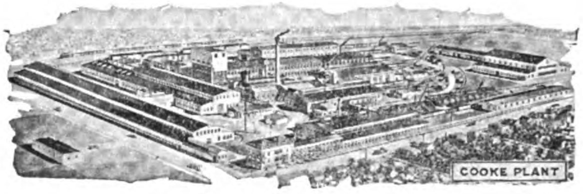
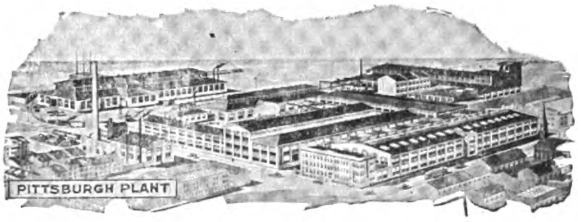


LOCOMOTIVES



Our organization is equipped to furnish every facility which long experience and abundant capital can provide for producing high-class work, and for conducting the business of manufacturing locomotives on the most economical basis to both purchaser and manufacturer.





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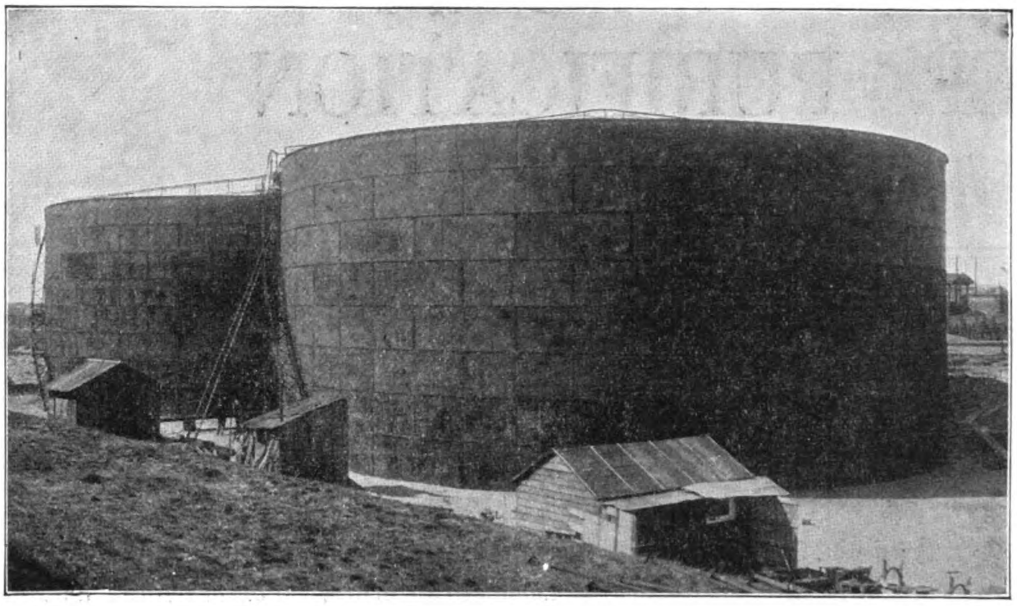

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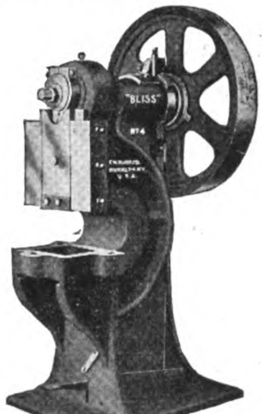

No. 4 Stiles Punching Press, This type press is built in a large number of sizes and widely used for many operations in the manufacture of the general line of hardware.

On account of the radically different shape and construction of articles which make up the general line of hardware, it is impossible to give an outline of the operations required in its manufacture, as we did in previous advertisements covering other lines of manufacture.

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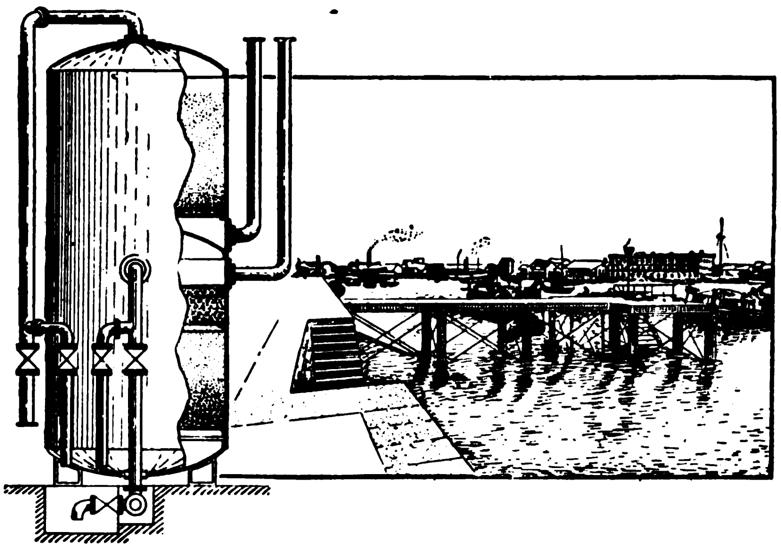
No. 244

WATER PURIFICATION



A Far Eastern Problem Solved

Left—Candy Patent "Mechanical Declor" Filter.

Right—View of Canton River showing the small pier under which is the suction intake pipe of the pumps. The muddy water, after being forced through the mechanical filter, "chlorified" and refiltered, comes out as an absolutely safe liquid fit for drinking purposes.

That impure drinking water breeds diseases is a fact upon which all health authorities agree. Natural water, even if clear and sparking in appearance, may yet contain dangerous bacteria and be capable of conveying diseases such as cholera, typhoid, etc.

To render a water supply absolutely safe for people's health, the mechanical type of filters such as the

CANDY FILTER

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Moreover, the cleaning of Candy Filters by a mechanical process is much more hygienic, rapid and simple; thereby increasing the filtering efficiency and reducing the areas of filter beds.

Installations of Candy Filters in China have proved their merit and adaptability. If you are interested in this profitable enterprise we will be pleased to furnish further information.

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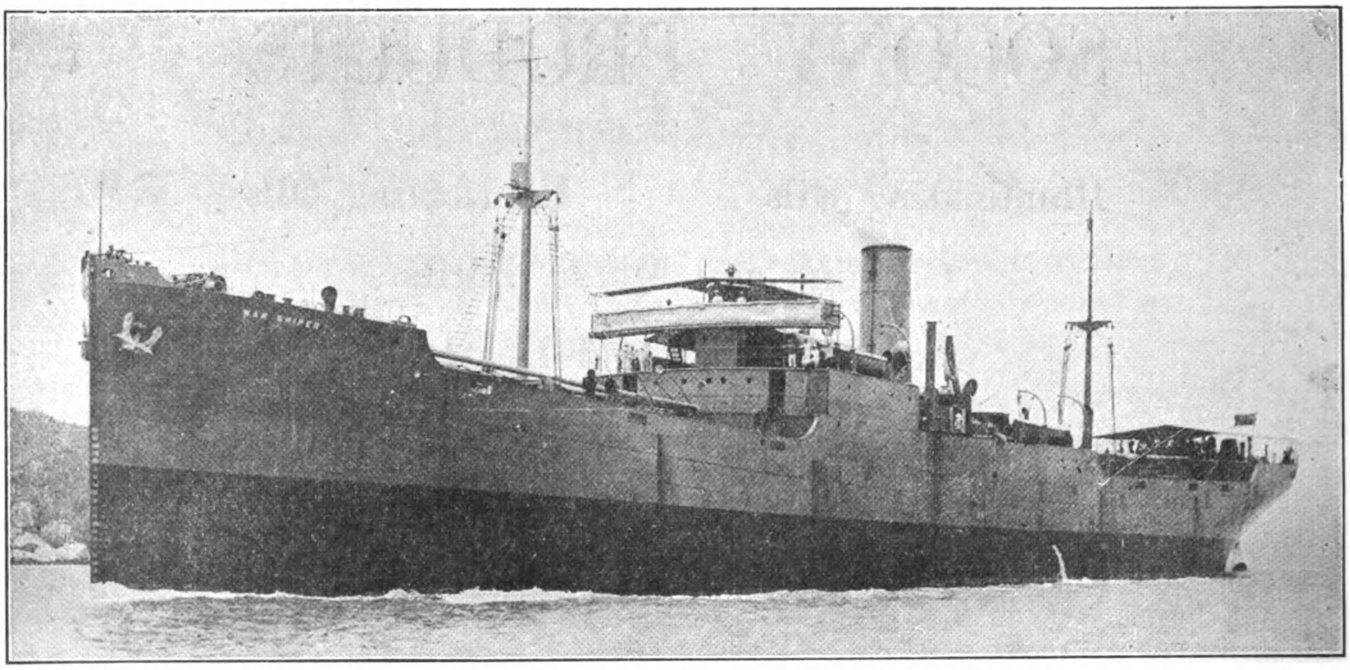

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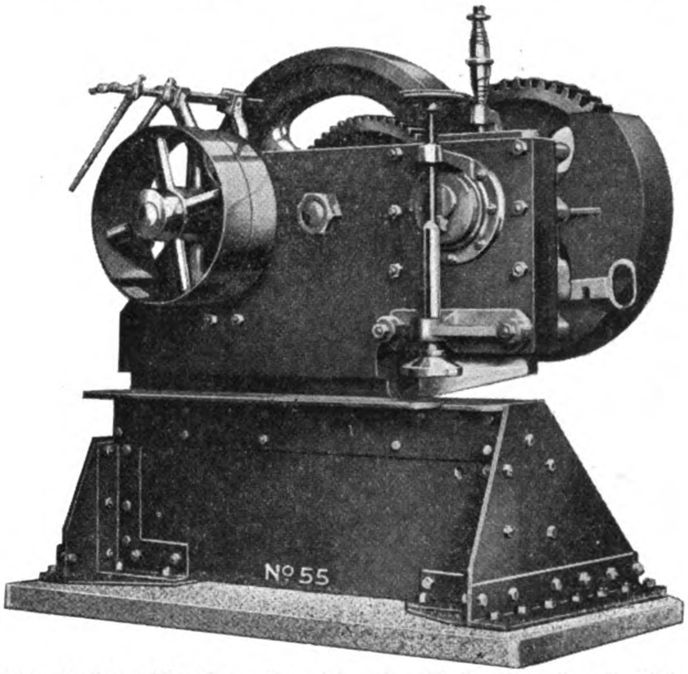

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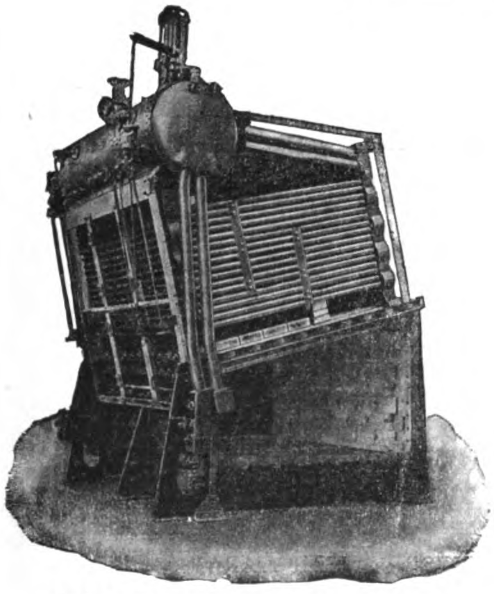

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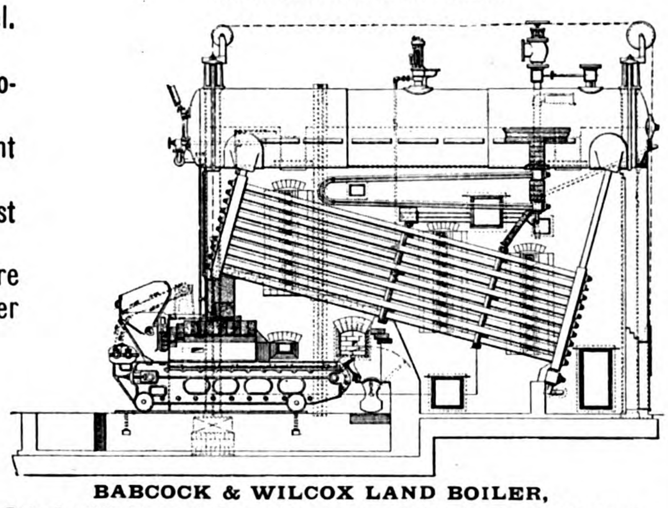

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fitted with Patent Superheater and Chain Grate Stoker
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Boilermakers, Dock Proprietors, Shipbuilders, Engineers and Electricians

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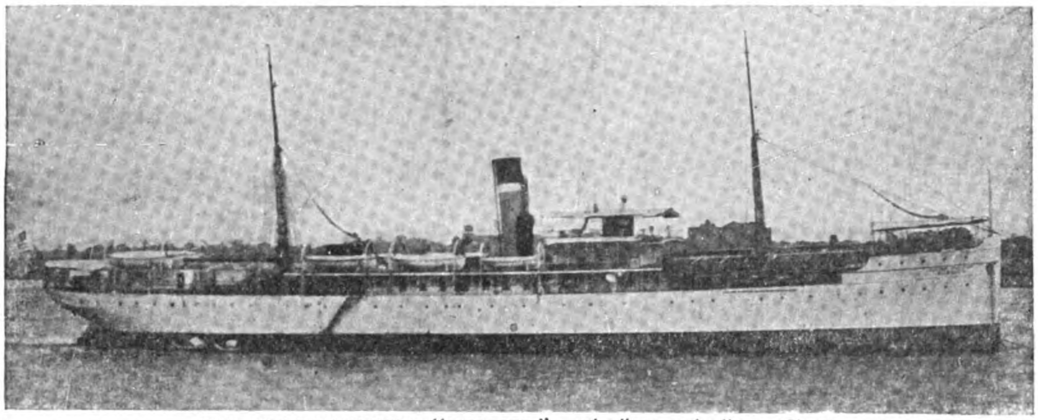

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		Breadth of Entrance	Depth of water on Sill
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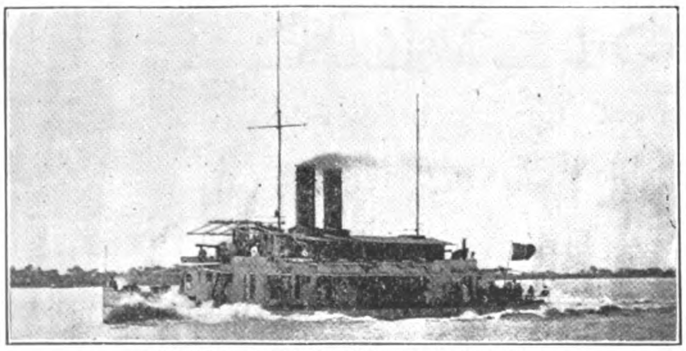
International Dock ...	528 ,,	77 ,,	23 ,,
Old Dock	399 ,,	53 ,,	16 ,,
Tunkadoo Dock ...	350 ,,	67 ,,	16 ,,



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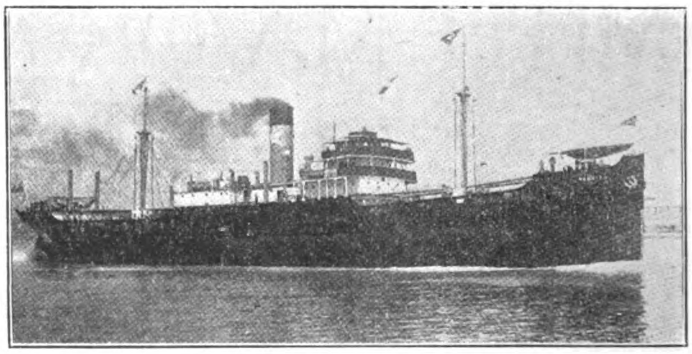
Length 160 feet. Twin Screw Engines.
Draft 2 feet 10 inches with full equipment and 30 tons of coal on board. Mean continuous speed 14 knots per hour.



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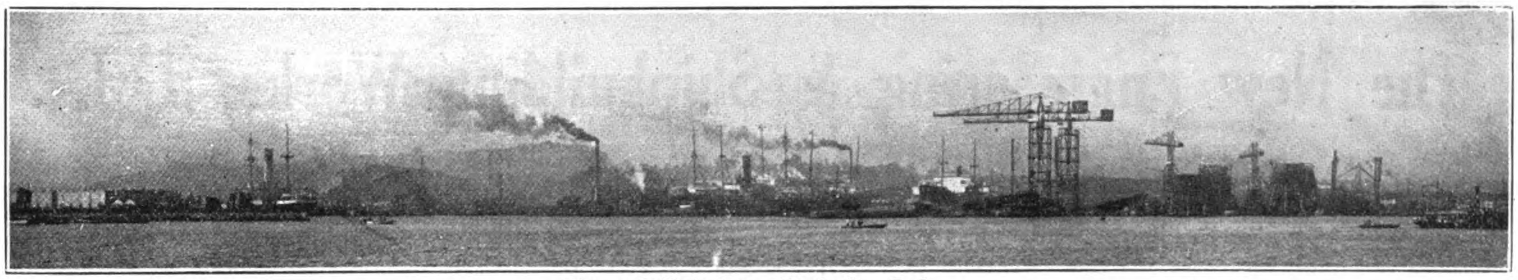
Built for the British Government.



View of Yokohama Dock Co., Ltd.

THE YOKOHAMA DOCK COMPANY, LTD.

Dock Owners, Shipbuilders, Repairers, Engineers, Machinists, Boiler Makers and Warehousemen.
Operating Dockyard, Shipbuildingyard and Storage Warehouses at Yokohama, Japan.

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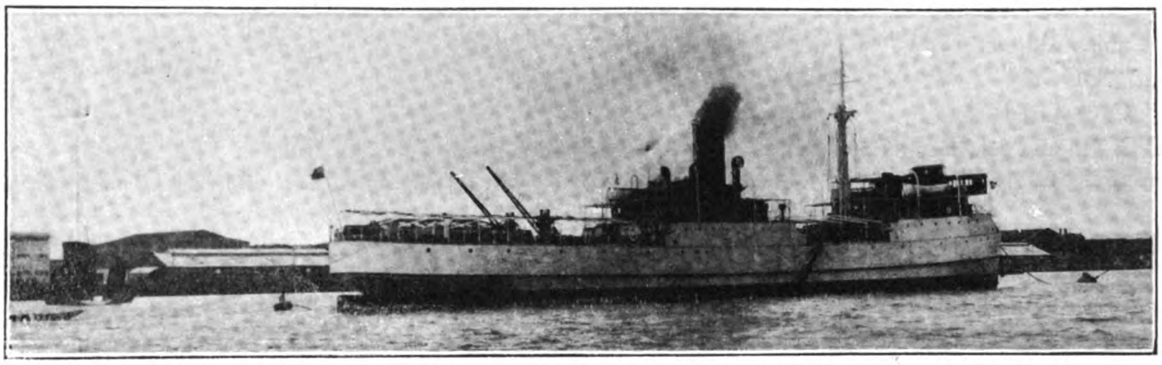

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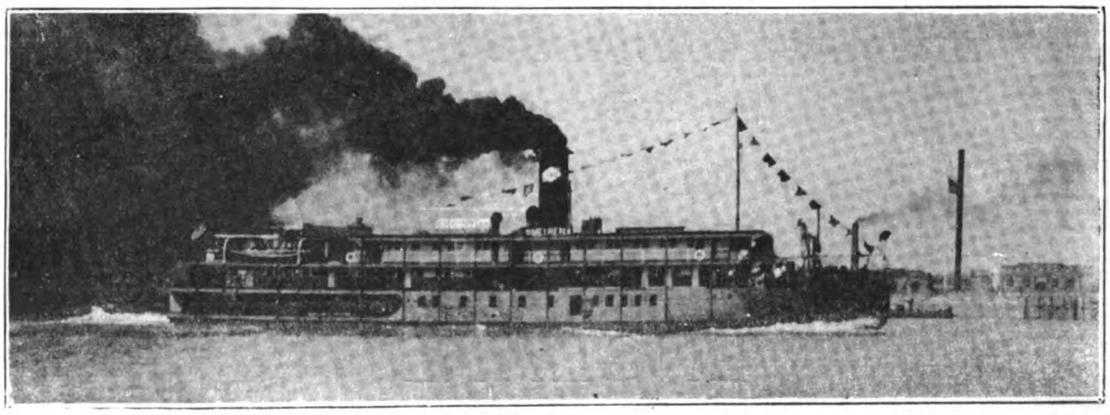

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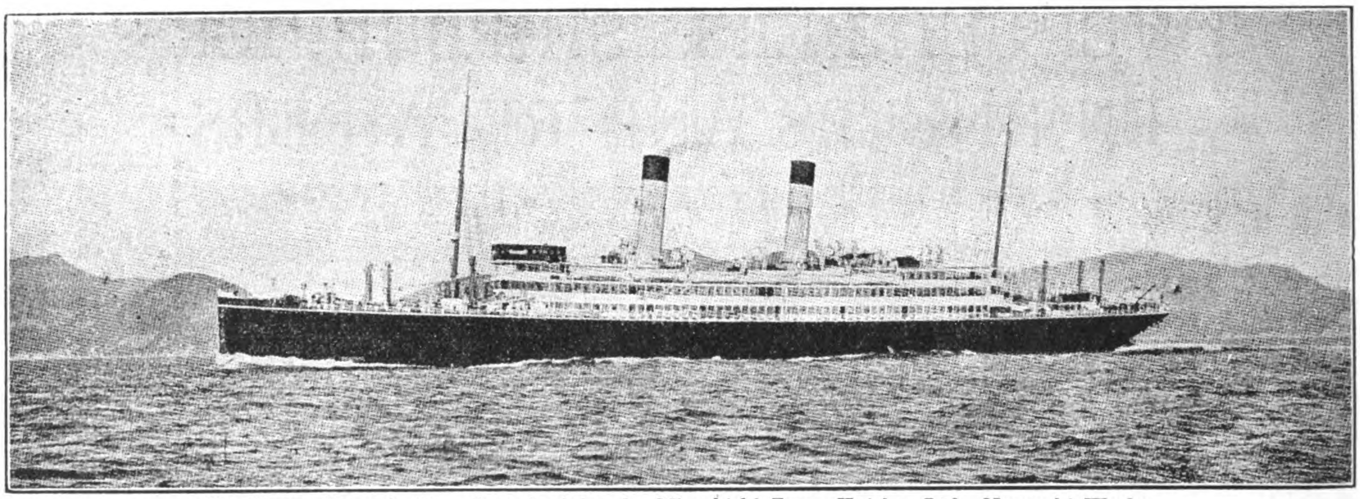

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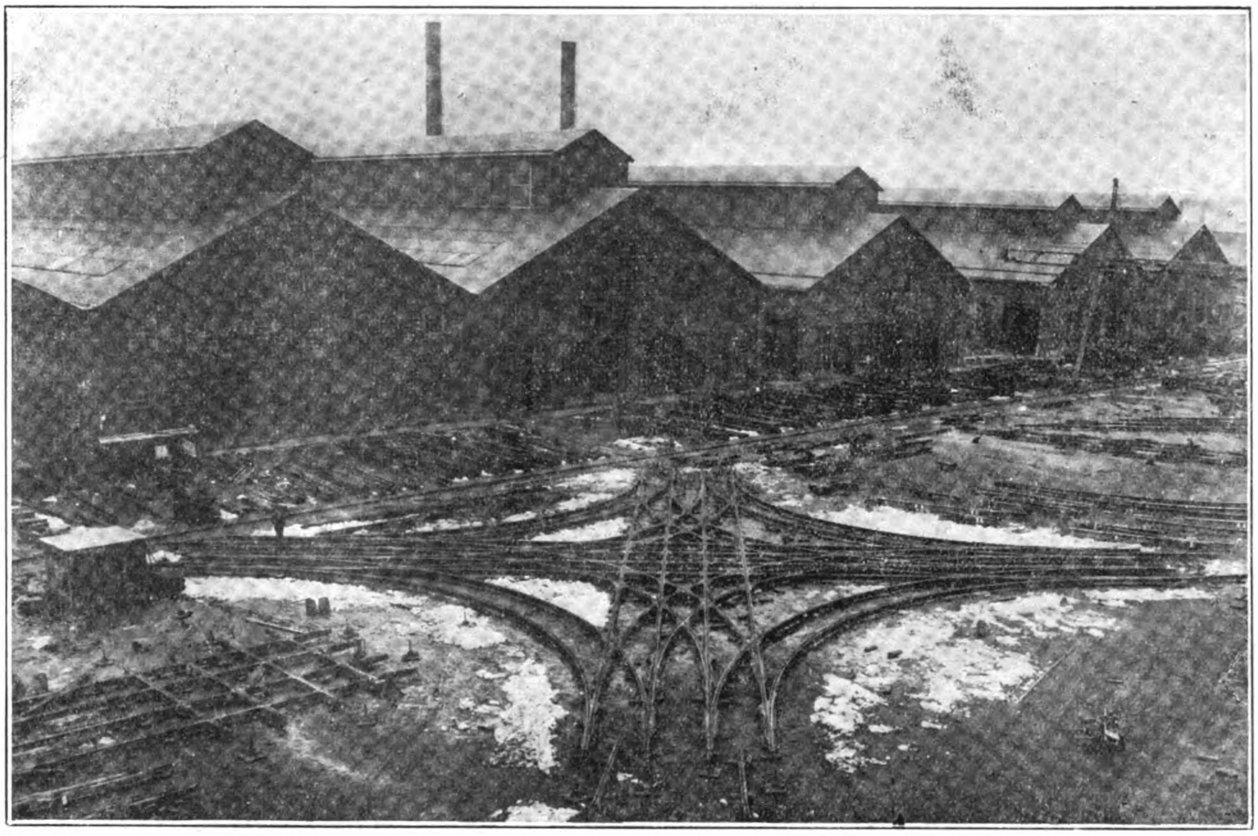

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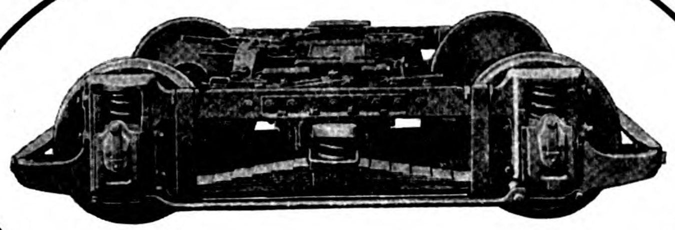

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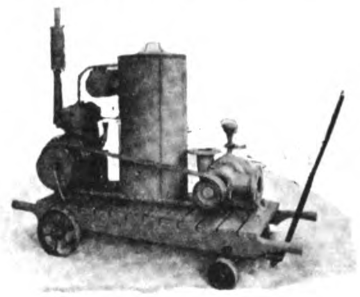

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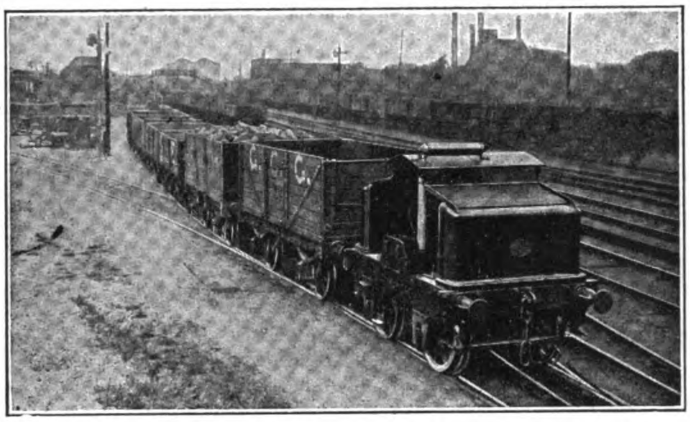

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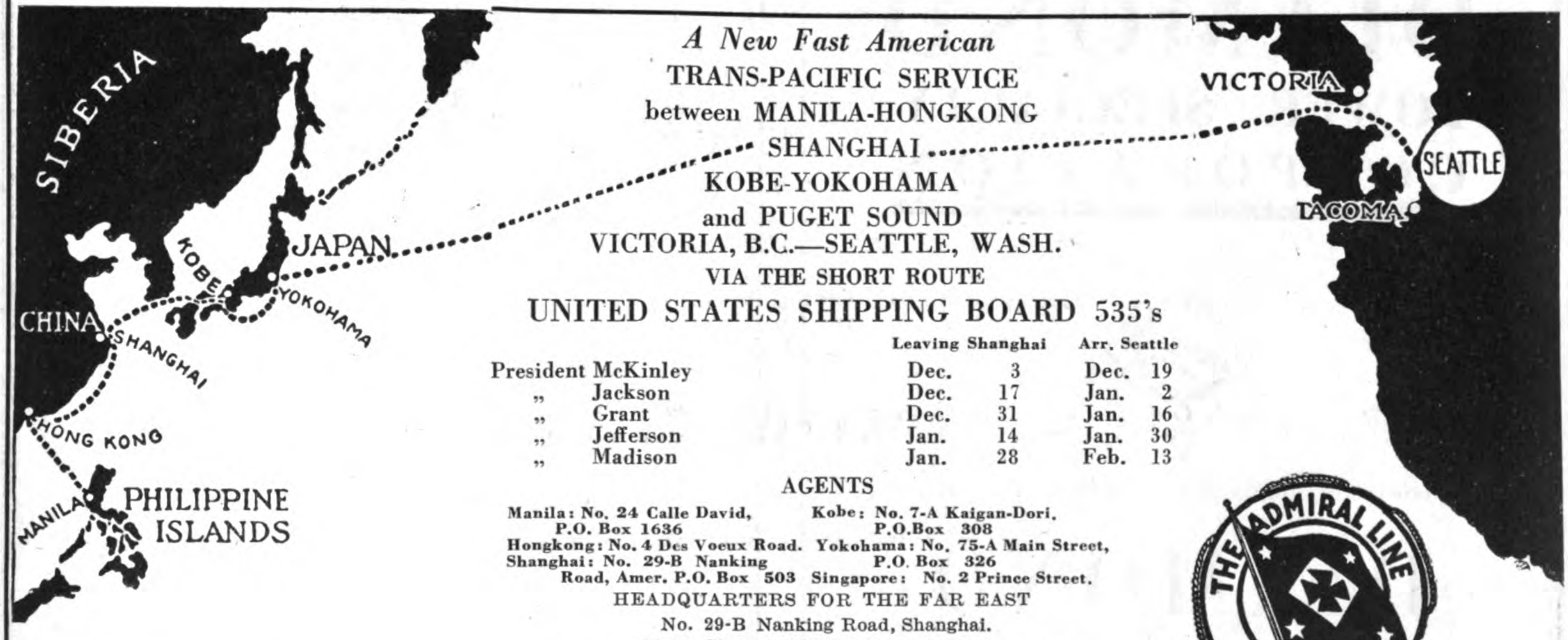

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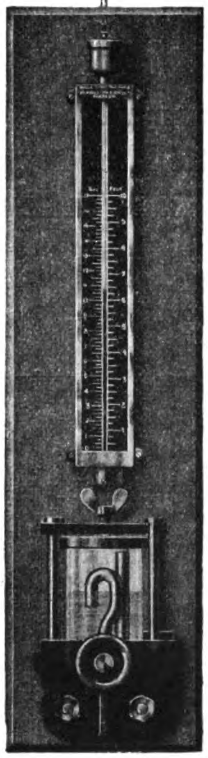

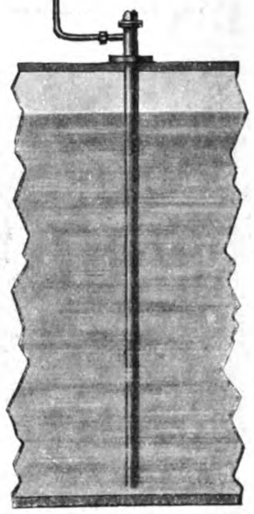

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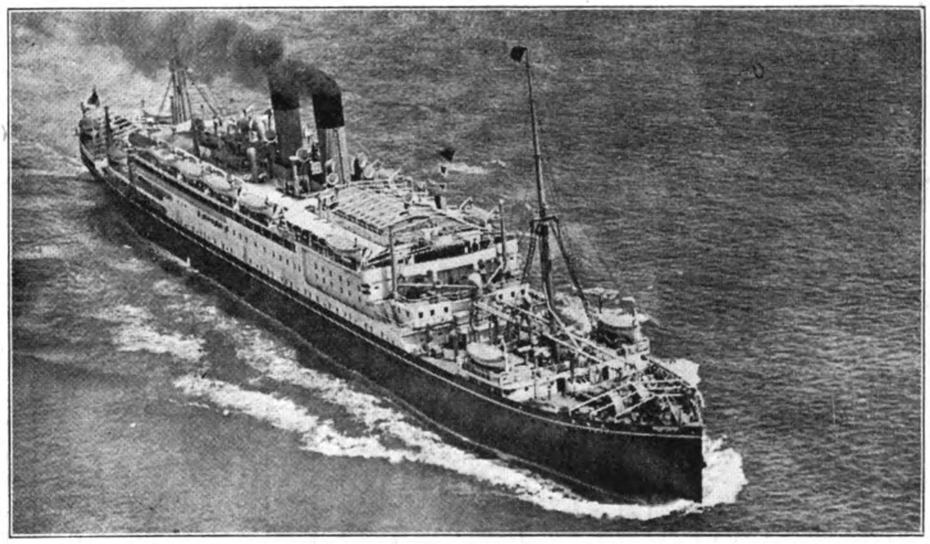

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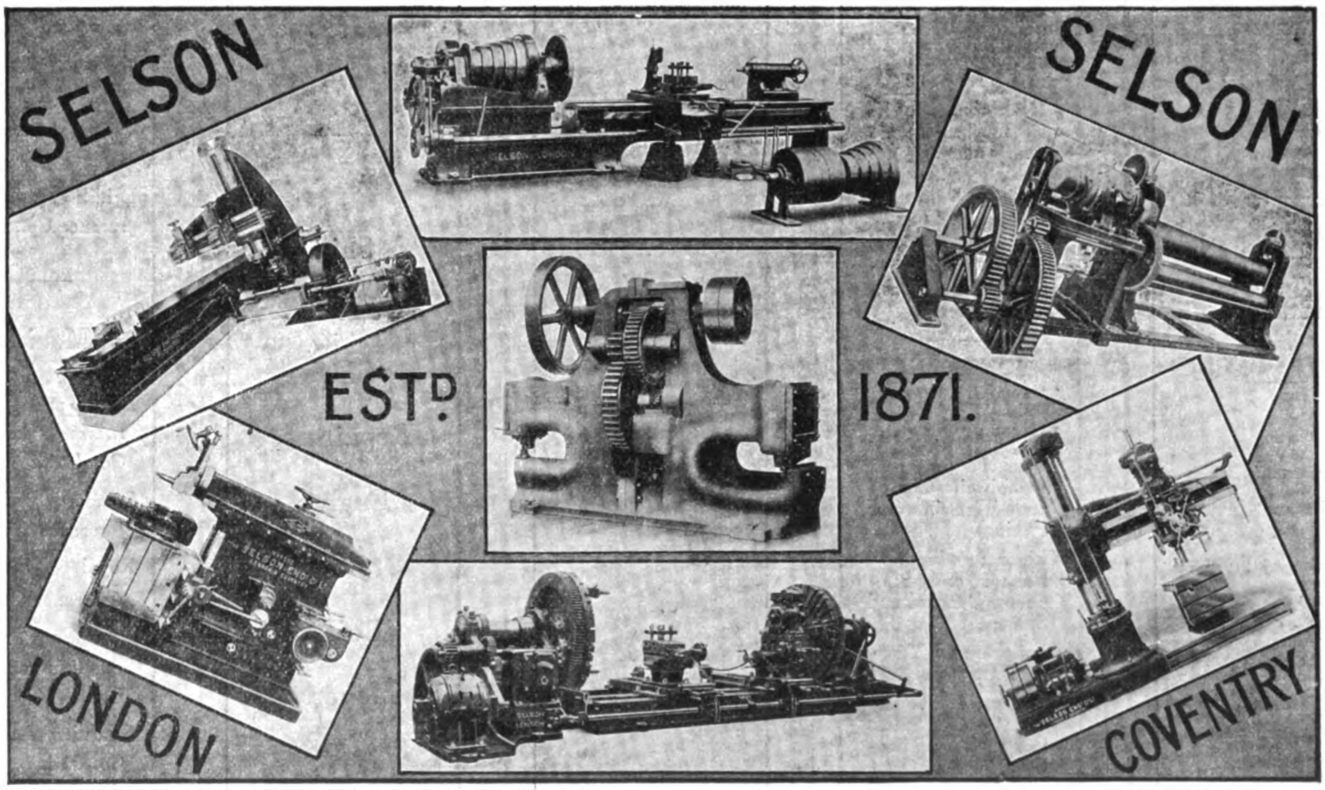

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Ryufuku-Maru	9,100	Yousan-Maru	5,000
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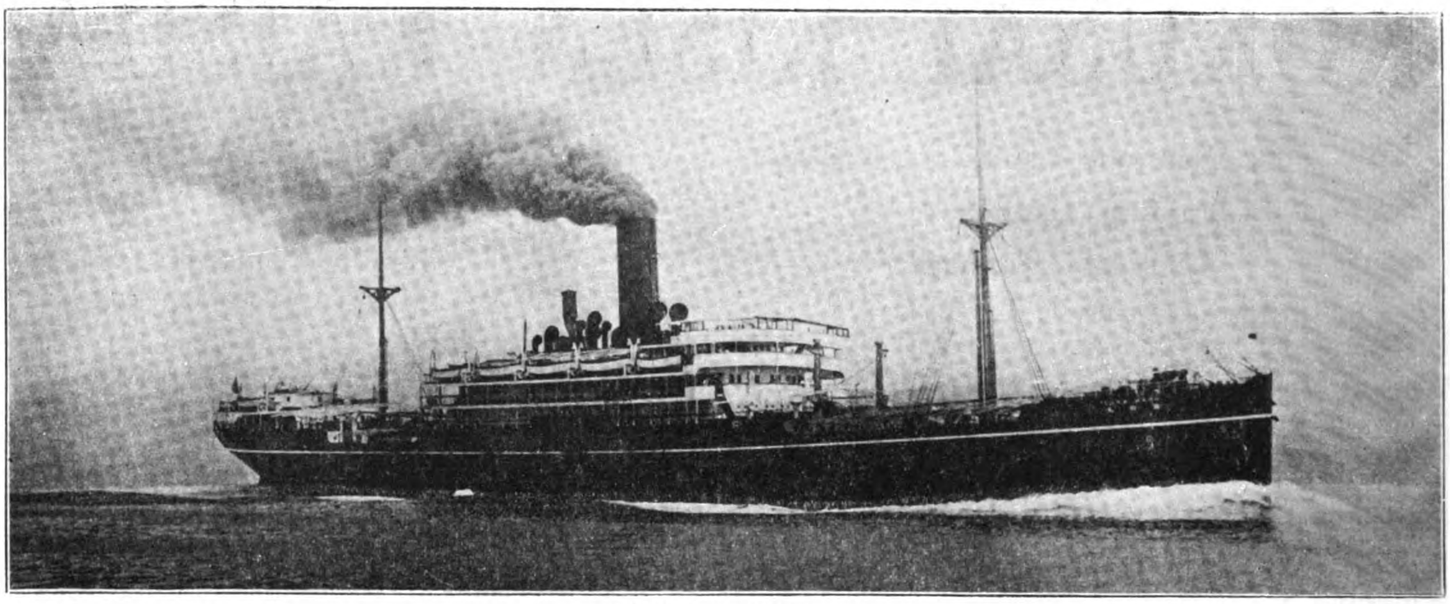

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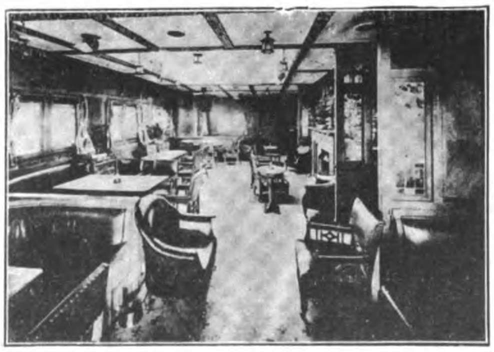
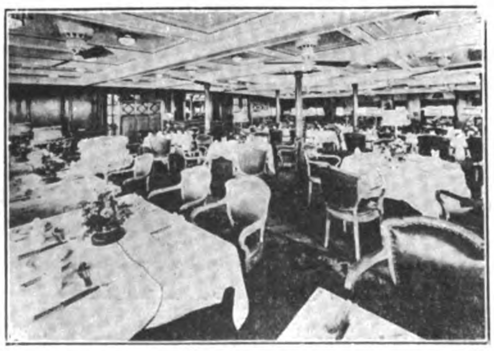
(FORTNIGHTLY) YOKOHAMA, KOBE, HONGKONG, SINGAPORE PENANG, RANGOON AND CALCUTTA.
(MONTHLY) CALCUTTA, MADRAS, COLOMBO, SUEZ, PORT SAID, ALGIERS AND NEW YORK.

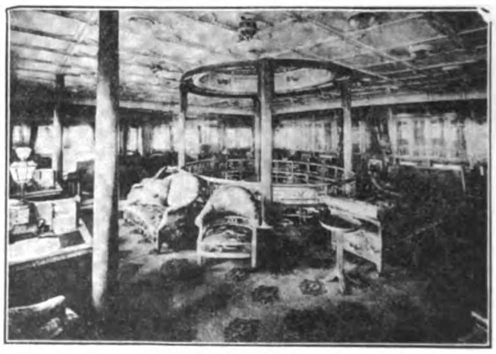
NEW YORK-FAR EAST LINE (Fortnightly)
KOBE, YOKOHAMA, SAN FRANCISCO, PANAMA, COLON, HAVANA AND NEW YORK.
NEW YORK TO JAPAN, CHINA AND PHILIPPINES.



Smoking Room



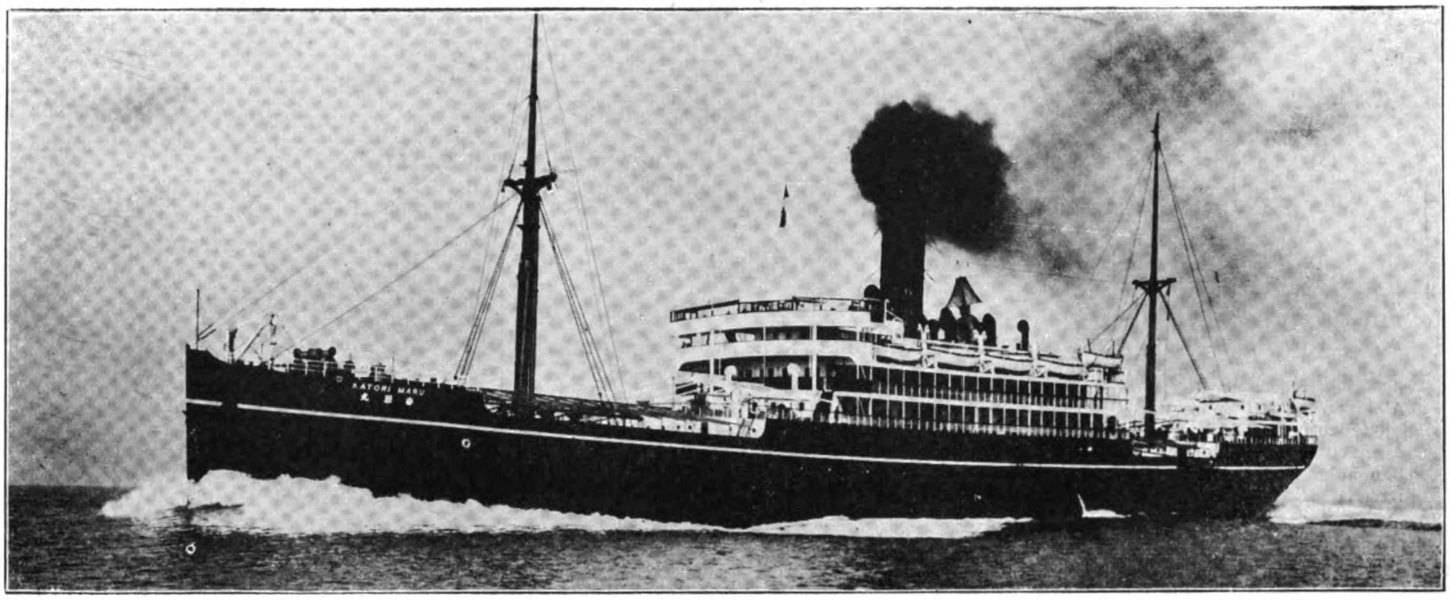
Dining Saloon



Social Hall

NIPPON YUSEN KAISHA

FLEET: 114 STEAMERS, 574,594 GROSS TONS



"KATORI MARU"

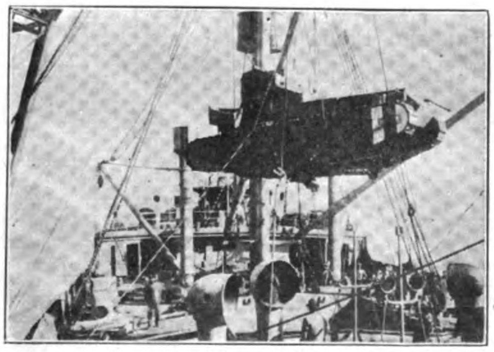
SEVEN SEAS

SHIPPERS WILL FIND QUICK DISPATCH, WITH WHARF, WAREHOUSE AND TERMINAL FACILITIES AT ALL PRINCIPAL PORTS SERVED BY N.Y.K. STEAMERS

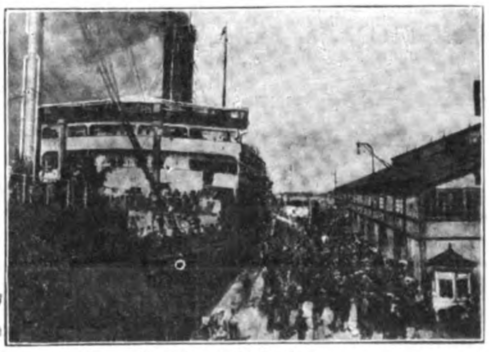
PRINCIPAL BRANCHES AND AGENCIES

Yokohama	Tokio	Nagoya	Keelung
Kobe	Moji	Nagasaki	Hankow
Hakodate	Otaru	Tientsin	Singapore
Tsingtao	Hongkong	Canton	Bombay
Penang	Colombo	Calcutta	Liverpool
Port Said	Marseilles	London	Chicago
Antwerp	Rotterdam	New York	Brisbane
Seattle	Manila	Townsville	Shanghai
Sydney	Melbourne	Osaka	

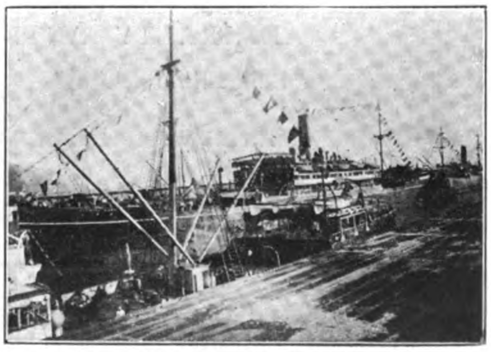
GIVE JAPANESE STEAMSHIPS THEIR SHARE OF YOUR JAPANESE CARRYING TRADE



Landing a Tank



Dock at Yokohama



Great Northern Dock at Seattle

Chartered Bank of India, Australia and China

INCORPORATED BY ROYAL CHARTER, 1853

Capital	**£3,000,000**
Reserve Fund	**£3,700,000**
Reserve Liabilities of Shareholders .	**£3,000,000**

Head Office: 38 BISHOPSGATE, LONDON, E.C.
Shanghai Branch: 18 THE BUND.

Court of Directors:

SIR MONTAGU CORNISH TURNER, *Chairman.*
SIR DUNCAN CARMICHAEL
THOMAS CUTBERTSON, Esq.
SIR ALFRED DENT, K.C.M.G.
SIR WILLIAM HENRY NEVILLE GOSCHEN, K.B.E.
THE RIGHT HON. LORD GEORGE HAMILTON, G.C.S.I.
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WILLIAM FOOT MITCHELL, Esq.
JAMES MAXWELL GRANT PROPHIT, Esq.
LEWIS ALEXANDER WALLACE, Esq.

Chief Manager: W. E. PRESTON
Managers: J. S. BRUCE & G. MILLER

Bankers:

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THE LONDON JOINT CITY & MIDLAND BANK, LTD.
THE LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.
THE NATIONAL PROVINCIAL & UNION BANK OF ENGLAND, LTD.
THE NATIONAL BANK OF SCOTLAND, LTD.

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Alor Star (Kedah)	Bombay	Colombo	Iloilo	Kuala-Lumpur (F.M.S.)	New York	Saigon	Taiping (F.M.S.)
Amritsar	Calcutta	Delhi	Ipoh	Madras	Peking	Seremban	Tavoy
Bangkok	Canton	Haiphong	Karachi	Manila	Penang	Shanghai	L. Burma
Batavia	Cawnpore	Hankow	Klang	Medan	Puket	Singapore	Tientsin
	Cebu	Hongkong	Kobe		Rangoon	Sourabaya	Yokohama

Drafts granted on the above Agencies and also on the principal Commercial Cities throughout the world. Bills of Exchange bought and received for collection. Travellers' Letters of Credit issued and every description of Banking and Exchange business undertaken.

C. J. SCOTT,
Manager

ATTWATER & SONS

MANUFACTURERS OF ALL KINDS OF

STEAM ENGINE and HYDRAULIC PACKINGS

PRESTON'S PERFECT PACKING The Best Self-setting Wedge Packing made

SILVERINE METALLIC For Acids and Superheated Steam

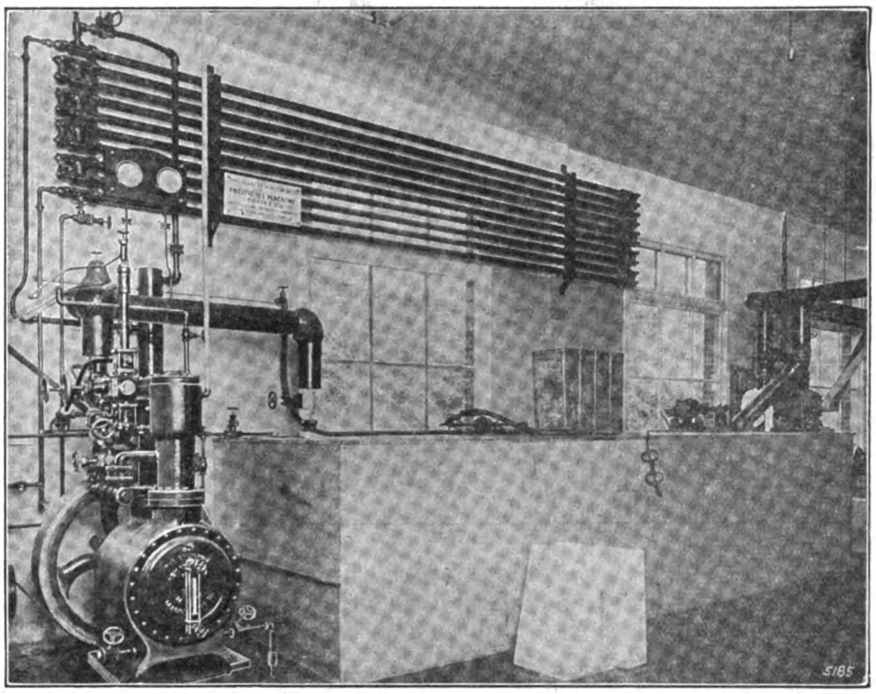
ADMIRALTY ANTI-FRICTION in Skins, known also as "Sausage Packing" and "Belleville Packing" The Best Floating Metallic Packing made

And all varieties of Frictionless, Graphited and Greasy Packings, made from

ITALIAN HEMP, ASBESTOS, COTTON, Etc.

Hopwood Street Mills, PRESTON, Eng. ESTABLISHED 1868

Telegrams: "Attwaters, Preston" *Telephone No.:* 1045 (2 lines) *Codes:* 5th Edition A.B.C., and Western Union



BRUNSWICK ICE PLANTS

Here is the illustration of a typical standard Brunswick ice plant. It shows a plant which will produce two tons of ice daily. We also manufacture standard plants varying in capacity from two hundred fifty pounds to six tons. These plants are furnished for either steam or belt drive and are especially adapted to small towns, haciendas, plantations, large camps, cantonments, hospitals, etc.

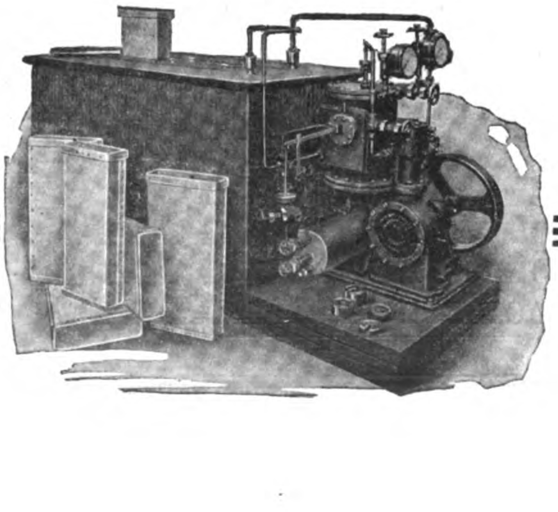
These plants are the finest of their kind. No pains have been spared to make them in every respect as perfect as possible. Their construction is simple. Their parts are few and interchangeable. They are strong, sturdy and rugged-built to stand hard usage and wear well. The running parts move free and true; the action is smooth and easy; the alignment of parts precise.

We want you to investigate these Brunswick ice plants if you are interested in ice-making machinery. You will find them built right, easy to operate, wonderfully efficient and dependable in every respect. Blue-prints and detailed instruction for installation and operation furnished with each plant.

A small, portable type is shown below. Detailed description in your own language on request.

BRUNSWICK—KROESCHELL CO.,

DEPT. 2, NEW BRUNSWICK, N.J., U.S.A.



NIPPON MENKWA
KABUSHIKI KAISHA

(THE JAPAN COTTON TRADING CO., LTD.)

LARGEST IMPORTERS AND EXPORTERS
IN THE FAR EAST

COTTON
COTTON YARN
COTTON PIECE GOODS
RAW SILK
WOOL
GENERAL COMMISSION MERCHANTS

Established 1892

HEAD OFFICE: No. 10 2-Chome, Nakanoshima, OSAKA, JAPAN
SHANGHAI OFFICE: 8 Hankow Road
TIENTSIN OFFICE: 42 Rue de France, French Concession

Capital Subscribed	Yen 50,000,000.00
Capital paid-up	Yen 20,250,000.00
Reserve Funds	Yen 26,825,000.00

MATAZO KITA, Esq., *President*
ATUSHI YAMADA, Esq., *Vice-President*

Directors :

K. SUYEYOSHI, Esq. G. IMAMURA, Esq. R. NAKAMURA, Esq.
H. OHOKA, Esq. T. SHIKATA, Esq. K. KUSUMOTO, Esq.
T. YASUI, Esq.

BRANCHES: Semba (Local), Dairen, Shanghai, Hankow and Bombay

AGENCIES: Kobe, Yokohama, Tokyo, Seito, Tientsin, Newchwang, Tiehling, Changchung, Harbin, Hongkong, Calcutta, Karachi, Rangoon, Alexandria, Liverpool, New York and Buenos Aires

SOLE BUYING AGENCY IN U.S.A.: Japan Cotton Trading Company of Texas, Fort Worth, Texas

SOLE BUYING AGENCY IN COREA: Corea Cotton Trading Company, Limited

FACTORIES: Cotton Press at Hankow, Cotton Gins and Presses in India

When You Go to America

Establish Acquaintance—A traveler making his Statler reservations need only address the first Hotel Statler he will visit. This hotel will take care of reservations in the other Statler cities, will assist him in getting in touch with people he wants to see, and will serve him in many other helpful ways.

There are five cities of the United States which you will almost certainly want to visit—and in each of them is a Statler-operated hotel. In all these hotels every room has a private bath and many other unusual and much-appreciated conveniences. In all of them especial attention is paid to the traveler from overseas. In any of them you can be sure that you are getting the best there is, at prices no higher than in other hotels of the first class.

ST. LOUIS — Hotel Statler
DETROIT — Hotel Statler
CLEVELAND—Hotel Statler
BUFFALO — Hotel Statler
NEW YORK — Hotel Pennsylvania

There will be another Hotel Statler, in Boston. It will have 1100 rooms and 1100 baths; opening date to be announced later.

Hotels Statler

This small picture of Hotel Pennsylvania will give you some idea of its size.

How to Reserve Accommodation

Reservations for accommodation at any of the Statler Hotels or Hotel Pennsylvania can be made at any office of Messrs. Thos. Cook & Son; or at principal hotels and steamship offices in the larger cities of the Orient; or at the offices of the Asia Banking Corporation in Shanghai, Hong Kong, Peking, Tientsin, Hankow, Canton, Singapore and Manila. Reservations so made can be depended upon absolutely.

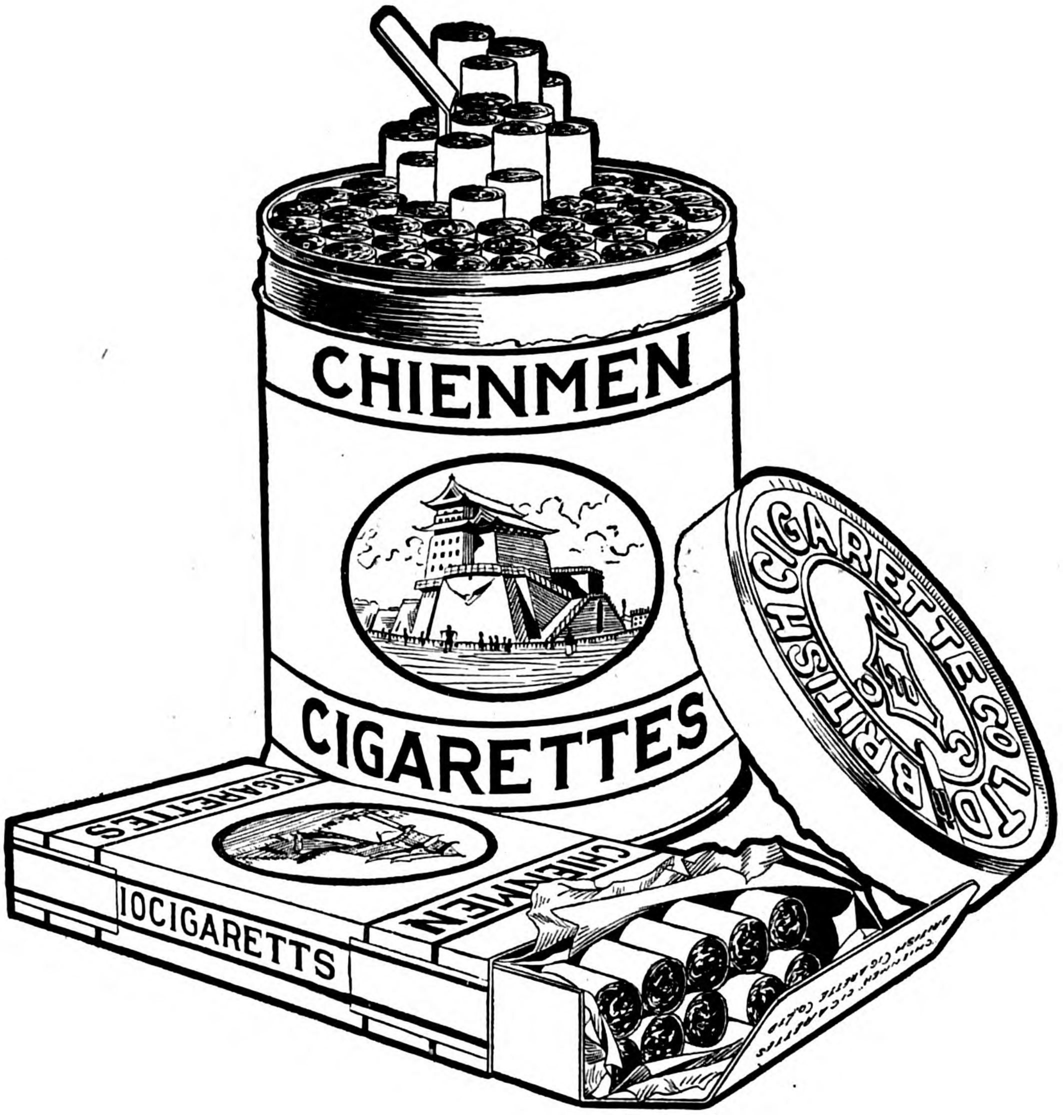
Hotel Pennsylvania

NEW YORK

Opp. Pennsylvania Terminal—**The Largest Hotel in the World**—2200 Rooms, 2200 Baths

CHIENMEN

Cigarettes

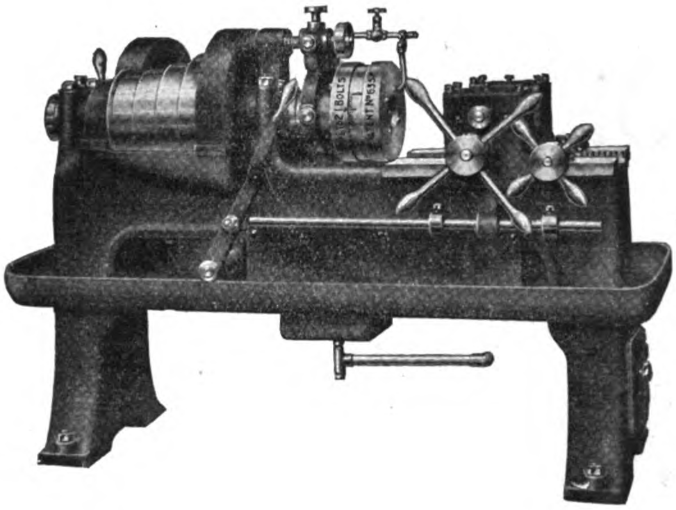


A brand well known to the "High Grade Cigarette Smoking Public" of China.

BRITISH-AMERICAN TOBACCO CO. (CHINA), LTD.

Distributors

Heap's Patent Screwing Machines



are made in all sizes, and suitable for dealing with all classes of work.

The illustration opposite shows our 2in. Patent Automatic Bolt Screwing Machine which is one of a complete line of Single and Multiple Head Machines specially designed for use wherever large quantities of Bolts have to be dealt with in the most expeditious and economical manner.

We will gladly advise you as to the most suitable machine for your particular class of work.

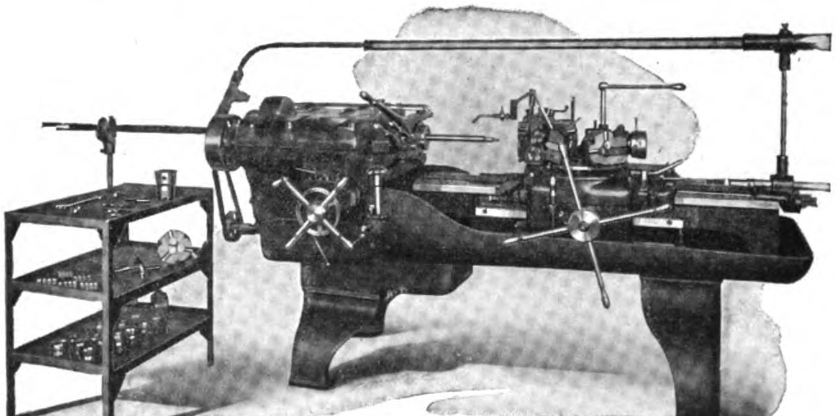
Catalogue free on request.

JOSHUA HEAP & CO., LTD.,

ASHTON-UNDER-LYNE, ENGLAND.

For the Small Shop or the Large One

The Hartness Flat Turret Lathe *fits the small shop*—even the shop so small that it has only just broken the habit of making a piece at a time. The Hartness Flat Turret Lathe *made a lasting reputation* for itself in the days of the small shop, on work which was *put through in small lots.* Its universal tool equipment was specially designed for this condition. The machine has since been *tremendously improved;* the improvements have increased its effectiveness *for small lot manufacturing,*



At the same time, the Hartness Turret Lathe is the *standard machine for large-lot manufacturing in big establishments.* The strength, stiffness, power and accuracy of the machine have given it a place held by no other. On bar or chuck work within its rang *its output per machine or per dollar of investment is unmatched.*

Catalogue and descriptive literature sent post free on request.

Jones & Lamson Machine Company

9-10 Water Lane, London, England
Cable Address: "Turretorum" London

Springfield, Vermont, U.S.A.
Cable Address: "Turret" Springfield, Vt.

THE BANK OF CHOSEN

Capital Subscribed - - - Yen 80,000,000
Capital Paid-up - - - Yen 50,000,000

Governor : S. Minobe, Esq.
Deputy-Governor : T. Kano, Esq.

Directors :

S. Ohta, Esq. S. Katayama, Esq.
S. Yoshida, Esq. S. Kakei, Esq.

Head Office: SEOUL (Chosen)

FOREIGN DEPARTMENT : TOKYO

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

Branches:

Japan Proper—Tokyo, Osaka, Kobe, Shimonoseki
Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Hoilyong, Chongjin
Manchuria—Antung, Fengtien (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingtsun
China Proper—Shanghai, Tientsin, Tsingtao, Tsinan
Siberia—Vladivostock, Alexandrofsky Post

NEW YORK AGENCY :

The City Investing Building, 165 Broadway, New York City

LONDON REPRESENTATIVE :

Gresham House, 24 Old Broad Street, London, E. C. 2

Correspondents:

San Francisco, Seattle, New York, London, Paris and in other commercial centers throughout the world

International Banking Corporation

CAPITAL - - - - - - - U.S. $5,000,000

SURPLUS AND UNDIVIDED PROFITS - - 10,458,137

OWNED BY THE NATIONAL CITY BANK OF NEW YORK

HEAD OFFICE: 60 WALL STREET, NEW YORK

LONDON OFFICE: 36 BISHOPSGATE, E.C.

LYONS OFFICE: 27 PLACE TOLOZAN

SAN FRANCISCO OFFICE: 232 MONTGOMERY STREET

BRANCHES:

CHINA
- SHANGHAI
- PEKING
- TIENTSIN
- HANKOW
- HARBIN
- HONGKONG
- CANTON

DOMINICA
- SANTO DOMINGO
- SANCHEZ
- SAN FRANCISCO
- SAN PEDRO
- SANTIAGO
- PUERTO PLATA
- BARAHONA
- LA VEGA

INDIA
- BOMBAY
- CALCUTTA
- RANGOON

JAPAN
- YOKOHAMA
- KOBE

JAVA
- BATAVIA
- SOURABAYA

PANAMA
- PANAMA
- COLON

PHILIPPINES
- MANILA
- CEBU

SPAIN
- BARCELONA
- MADRID

STRAITS SETTLEMENTS
- SINGAPORE

We are also able to offer our Customers the services of the Branches of the National City Bank of New York in the principal countries of South America, Central America and in the West Indies.

Commercial and Travellers' Letters of Credit, Bills of Exchange and Cable Transfers bought and sold. Current Accounts opened and Fixed Deposits in local and foreign currencies taken at rates that may be ascertained on application to the Bank.

H. C. GULLAND, *Manager.*

1A KIUKIANG ROAD.

BANQUE DE L'INDO-CHINE.

Capital ... ... **Frs. 72,000,000**
Reserves ... ... **„ 70,000,000**

HEAD OFFICE: 96 BOULEVARD HAUSSMANN, PARIS.

Succursales et Agencies:

Bangkok	Haiphong	Mongtze	Pnom-Penh	Singapore
Battambang	Hankéou	Nouméa	Pondichery	Tientsin
Canton	Hanoi	Papeete	Saigon	Tourane
Djibouti	Hongkong	Peking	Shanghai	

Bankers:

IN FRANCE: Comptoir National d'Escompte de Paris, Credit Lyonnais; Banque de Paris et des Pays-Bas; Crédit Industriel et Commercial Société Générale.

IN LONDON: The National Provincial and Union Bank of England, Ltd.; Comptoir National d'Escompte de Paris; Crédit Lyonnais.

The Shanghai Agency undertakes all banking operations and exchange business; grants credits on goods and approved securities and receives deposits on current and fixed deposits according to arrangement.

L. ARDAIN, *Manager.*

JUGO GINKO, LIMITED

(THE FIFTEENTH BANK)

TOKYO, JAPAN

Telegrams: "Jugo Tokio"

Capital Subscribed Y. 100,000,000 Capital Paid-up Y. 49,750,000 Reserve Funds Y. 23,900,000

***President*: The Hon. Iwao Matsukata *Vice-President*: Masayasu Naruse, Esq.**

***Managing Directors*: Yutsuha Sato, Esq. and Kanesato Aiko, Esq.**

***Head Office Manager*: Sei Usagawa, Esq.**

***Head Office*: No. 6, 7chome, Kobiki-cho, Kyobashiku, Tokyo.**

BRANCHES:

SHIMBASHI, MARUNOUCHI, GOFUKUBASHI, TOHORISANCHOME, KAKIGARACHO, NINGYOCHO, RYOGOKU, FUKAGAWA, KANDA (TOKYO). OSAKA, SENBA, TAMATSUKURI, NISHI, KUJO, MINAMI, NAMBA, TENNOJI, KITA, TENGACHAYA (OSAKA), KOBE, SAKAEMACHI, FUKIAI, HYOGO (KOBE). KYOTO, NAGOYA, SAKAI, WAKAYAMA, NISHINOMIYA. OKAYAMA, HIROSHIMA, SHIMONOSEKI, FUKUOKA, KUMAMOTO, KAGOSHIMA, SENDAI.

LONDON BANKS AND AGENTS:

LAZARD BROTHERS & CO., LTD. LONDON COUNTY WESTMINSTER AND PARR'S BANK, LTD. UNION DISCOUNT CO. OF LONDON, LTD.

A Bank with 700 Branches.

YOUR BUSINESS in Canada, Central and South America, Cuba and throughout the West Indies can be promptly and efficiently handled by our branches in these countries. We shall be pleased to act as your correspondent for Letters of Credit, &c.

The Royal Bank of Canada

HEAD OFFICE: MONTREAL.

600 branches in Canada and Newfoundland.
100 branches elsewhere.

LONDON, ENG. NEW YORK, U.S.A.
PARIS, FRANCE. BARCELONA, SPAIN.

The First National Bank of Boston

The leading financial institution of New England

Foreign and domestic commercial banking of every nature.

Correspondence solicited.

THE BANK OF TAIWAN, LTD.

Established 1899

TAIPEH, FORMOSA, TAIWAN

Tokio Branch: No. 1 Eirakucho, 2 Chome, Kojimachi

Telegraphic Address: TAIWANGINK

Telephones: 1060,1066,446,449 Marunouchi

Capital Subscribed	Y. 60,000,000
Capital Paid-up	Y. 52,500,000
Reserve Funds	Y. 11,780,000

President :
Kojuro Nakagawa, Esq.

Directors :
Gunji Kawasaki, Esq.
Kumematsu Morinaga, Esq.
Masumi Esaki, Esq.
Tadasu Hisamune, Esq.
Denkichi Takita, Esq.

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Japan :	Tokyo, Kobe, Moji, Osaka, Yokohama.
Taiwan :	Keelung, Tainan, Takow, and 11 others.
China :	Amoy, Canton, Foochow, Hankow, Kiukiang, Shanghai, Swatow.
London :	25 Old Broad Street.
New York :	165 Broadway, Benenson Investing Bldg.
Others :	Bangkok, Batavia, Bombay, Hongkong, Semarang, Singapore, Soerabaia.

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In the Principal cities and towns throughout the World. Interest allowed on fixed Deposits and Current Accounts on terms which may be ascertained on application. Most favorable terms are granted to Petty Current Accounts. Every description of Exchange and General Banking business transacted.

Special facilities are available for exchange business on China, Strait Settlements, East Indies, Australia, Great Britain, America, Canada and South Africa, etc.

K. NAKAGAWA *President.*

Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

---

CAPITAL SUBSCRIBED - - - - - Yen 50,000,000

HEAD OFFICE:
MARUNOUCHI, TOKYO. CABLES "KOGIN," TOKYO

BRANCHES:
TOKYO: NIHONBASHI
OSAKA: KORAIBASHI
KOBE: NAKAMACHI

H. HIJIKATA, Esq., President
Y. ONO, Esq., Vice-President
K. IYANAGA, Esq., Director
T. IWASA, Esq., Director
KOZO MATSUMOTO, Esq.

AUDITORS:
NAGATANE SOMA, Esq.
KINTARO HATTORI, Esq.
TAICHI OHBA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

BUSINESS TRANSACTED:

1.—Loans on the security of public bonds of debentures and shares, estates (Zaidan), specified land and buildings.
2.—Subscription and underwriting public bonds or debentures.
3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

BANK OF COMMUNICATIONS

(Specially authorised by Presidential Mandates of April 7th, 1914 and October 31st, 1915 making the Bank of Communications a National Bank).

Head Office: Peking

CAPITAL . . Kuping Tls. 10,000,000

President: TSAO JOU LIN

Vice-President: JEN FUNG PAO

Every description of Banking and Exchange business transacted.
Interest allowed on Current Accounts and Fixed Deposits according to arrangement.
Credits granted on approved Securities.
Special Facilities for Transfers to all parts of China.

Branches

CHIHLI PROVINCE.—Peking, Tientsin, Tungchow, Paotingfu, Haitien, Tangshan, Shuntefu, Shengfang.

SHANTUNG PROVINCE.—Tsinanfu, Tsininchow, Chefoo, Techow, Tsaochwang, Lungkow.

HONAN PROVINCE.—Kaifeng, Lohyang, Chengchow, Chiaotso, Chowchiakow, Taokow, Leiho, Hsinhsiang, Changtefu, Hsinyangchow.

SHANSI PROVINCE.—Shihchiachwang, Tatungfu, Fengcheng, Yangkao.

KIANGSU PROVINCE.—Shanghai, Soochow, Wusieh, Chinkiang, Yangchow, Tsing-kiangpu, Pukow, Penpu, Hsuchow.

CHEKIANG PROVINCE.—Hangchow, Ningpo.

HUPEH PROVINCE.—Hankow, Shasi, Ichang.

KIANGSI PROVINCE.—Kiukiang.

HUNAN PROVINCE.—Changsha, Changteh, Yochow, Hengchow, Hsiangtan

SZECHUAN PROVINCE.—Chungking.

ANHWEI PROVINCE.—Wuhu, Anking, Hsuancheng, Panpu

KWANGTUNG PROVINCE.—Canton.

THREE EASTERN PROVINCES.—Yinkow, Fengtien, Changchun, Kirin, Tiehling, Sunchiatai, Liaoyang, Harbin, Chinhsien.

SPECIAL DISTRICTS.—Jehol, Kueihuacheng, Lenghsien, Chihfeng, Hsinsi, Kalgan (Chahar).

ABROAD.—Hongkong, Singapore.

THE SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

OWNERS OF BESSHI COPPER MINE, COAL MINES, SILVER AND GOLD MINES, ETC.

MANUFACTURERS OF

Tubes, Plates, Sheets and Bars of Copper, Brass, Bronze and other Alloys, Solid and Drawn Steel Tubes, Nails, Etc.—Superphosphate and Composite, Manure, Sulphuric and Nitric Acid, etc.

GENERAL WAREHOUSE BUSINESS AND FORESTRY ENTERPRISES

WORKS AND DEPARTMENTS

Warehouses ... ... Osaka, Kobe & Tokyo
Mining Offices ... ... Besshi, Wakamatsu, Sapporo & Ohgayu
WORKS:
Copper Works ... ... Osaka
Fertilizer Works ... ... Niihama
Sales Departments .. .. Osaka, Kobe, Tokyo, Kure, Yokosuka, Hakata, Shanghai, Hankow and Tientsin

THE SUMITOMO STEEL WORKS, LTD.

OSAKA, JAPAN

MANUFACTURERS OF

Steel Ingots, Steel Forgings, Steel and Iron Castings of Every Description for Railways, Shipbuilding Yards, Mines, Hydraulic Electric and Other Engineering Works, etc., etc.

THE SUMITOMO ELECTRIC WIRE & CABLE WORKS, LIMITED

OSAKA, JAPAN

MANUFACTURERS OF

Copper, Brass, Bronze and Nickel Wires and Strips, Trolley Wires, Insulated Wires and Cables of Every Description for Telephone, Telegraph, Lighting, Power Transmission, etc., etc.

THE SUMITOMO BANK, LIMITED

Head Office: OSAKA, JAPAN
Cable Address: "SUMITBANK"
President: Baron K. SUMITOMO
Established March, 1912
(Successors to The SUMITOMO BANK)

Capital Subscribed	Yen 70,000,000
Capital Paid-up	„ 50,000,000
Reserve Fund	Yen 23,100,000
Deposits	„ 369,000,000

Head Office: Kitahama, Osaka
City Offices: Semba, Bingomachi, Nakanoshima, Dotonbori, Kawaguchi, Tenma, Nipponbashi.
Home Branches: Tokyo (Tokyo, Toriaburacho, Fukagawa, Shinbashi, Asakusa), Marunouchi, Yokohama, Nagoya, Kyoto (Kyoto and Nishijin), Kobe (Kobe and Hyogo), Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Wakamatsu, Kokura, Hakata and Kurume.

Foreign Branches: Shanghai, Hankow, Bombay, London, New York and San Francisco.
Agents: The Sumitomo Bank of Hawaii, Ltd., Honolulu, Lloyds Bank, Ltd., London, National City Bank of New York, New York.
Correspondents: In all important places at home and abroad.

The Bank buys, sells and receive for collection Drafts and Telegraphic Transfers, issues Commercial and Travellers Letters of Credit available in all important parts of the world, besides doing general Banking business.

THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000

CAPITAL PAID-UP - - - Yen 30,000,000

CHAIRMAN:

Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Mikitaro Kikuchi Mr. Kiyoshi Sejimo

Mr. Takeo Kato

HEAD OFFICE:

No. 3 Yayesucho Nichome, Kojimachi-ku,
Tokyo, Japan.

BRANCH OFFICES:

Fukagawa (Tokyo), Marunouchi (Tokyo), Nihombashi (Tokyo), Osaka, Nakanoshima (Osaka), Semba (Osaka), Kobe, Sannomiya (Kobe), Kyoto, Nagoya, Otaru, Shanghai, New York and London.

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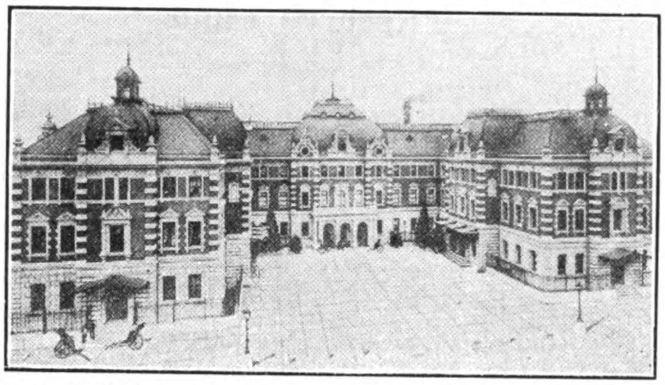

Capital Subscribed... ....Y. 100,000,000.00
Capital Paid-Up.....................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku,
TOKYO

BOARD OF DIRECTORS:

GENYEMON MITSUI, Esq. (*President*); SEIHIN IKEDA, Esq., UMEKICHI YONEYAMA, Esq., NAOJIRO KIKUMOTO, Esq. and OTOHIKO MAJIMA, Esq. (*Managing Directors.*)

TOMITARO HARA, Esq., KANETARO KISHIMOTO, Esq., HIROKICHI KAMESHIMA, Esq. and KIKUSABURO FUKUI, Esq. (*Directors*).

Branches:

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Foreign Agents:

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London Joint City & Midland Bank, Ltd.
New York: The National City Bank of New York.
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Paris: Banque de l'Union Parisienne.
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THE DAI-ICHI GINKO, LTD.

(FORMERLY THE FIRST NATIONAL BANK)

ESTABLISHED 1873

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Reserve Fund - - - -	Yen 33,500,000.00

Y. SASAKI, *President*

K. ISHII, *Managing Director.* Y. NOGUCHI, *Managing Director.* S. SUGITA, *Managing Director.*

HEAD OFFICE:

No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.

T. AKASHI, *Manager*

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HOME BRANCHES:

YOKOHAMA, NAGOYA, YOKKAICHI, KYOTO, NISHIJIN (KYOTO), GOJO (KYOTO), FUSHIMI, OSAKA, NISHIKU (OSAKA), MINAMIKU (OSAKA), HONMACHI (OSAKA), KOBE, HYOGO, HIROSHIMA, SHIMONOSEKI, CHOFU, MOJI, FUKUOKA, KURUME, KUMAMOTO, HAKODATE, OTARU, SAPPORO, MURORAN.

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SEOUL, FUSAN.

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New York: The National City Bank of New York.; The National Bank of Commerce in New York.; The Yokohama Specie Bank, Ltd.

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YOKOHAMA BRANCH: Nos. 53-55 Honcho Shichome
OSAKA BRANCH: 28 Bingo-machi, Nichome
KYOTO BRANCH: Shijo Higashinotoin
SHINMACHI BRANCH: Shinmachi Dori Sanchome

President: K. IKEDA, Esq.

Managing Director: S. CHOH, Esq.

SUBSCRIBED CAPITAL - - - - -	Yen 25,000,000
CAPITAL PAID-UP - - - - - -	Yen 17,500,000
RESERVE FUND - - - - - -	Yen 8,094,340
DEPOSITS - - - - - - - -	Yen 110,740,264

Transacts General Banking and Foreign Exchange Business. Conducts Trust Company Business.

Hongkong and Shanghai Banking Corporation

Paid-up Capital	... ...	$20,000,000
Reserve Funds:	Sterling	£4,500,000
	Silver	$23,500,000
Reserve Liability of Proprietors	... ...	$20,000,000

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Hon. Mr. A. O. LANG, Deputy Chairman
D. G. M. BERNARD, Esq.
G. T. M. EDKINS, Esq.
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W. L. PATTENDEN, Esq.
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Head Office:
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Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

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COLOMBO	PENANG
DAIREN	RANGOON
FOOCHOW	SAIGON
HAIPHONG	S. FRANCISCO
HAMBURG	SHANGHAI
HANKOW	SINGAPORE
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ILOILO	SUNGEI PATANI
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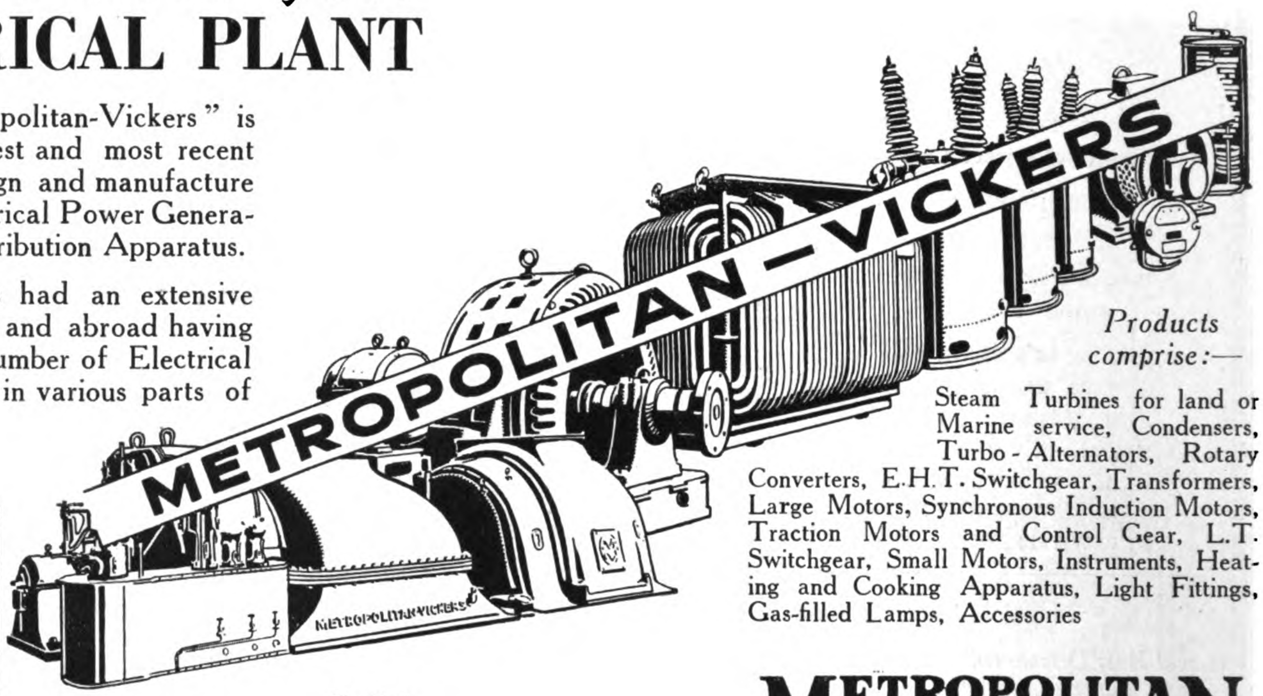

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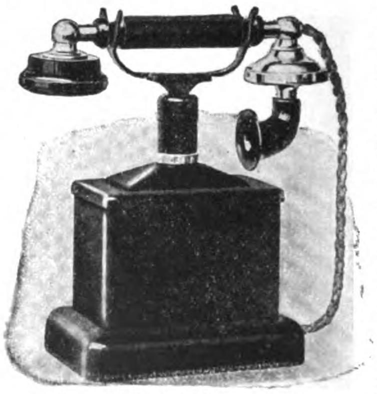

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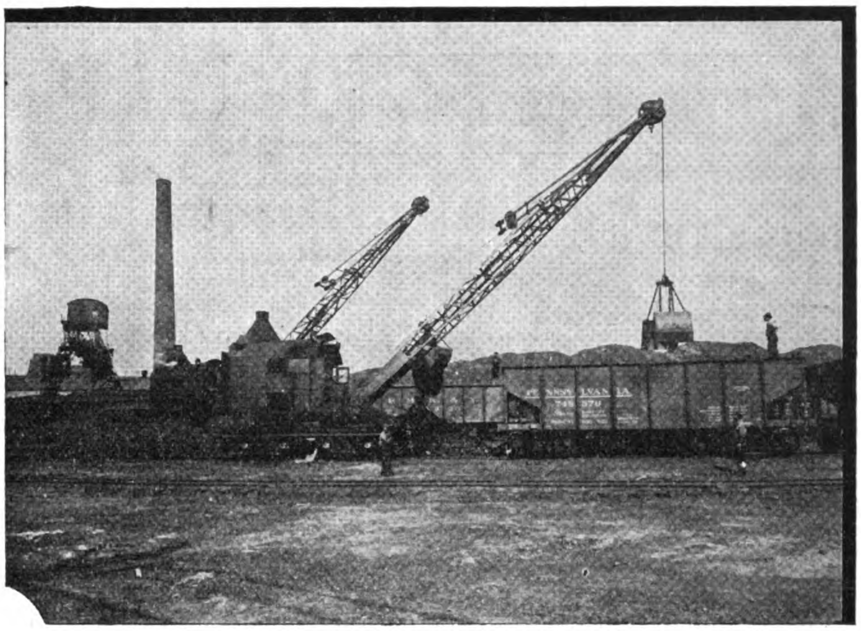

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Governments and Industrial Corporations about to place orders for motive power of any type should give the most careful study and attention to design and equipment. Baldwin Industrial Locomotives are known throughout the entire world by reason of correct design, especially suited to the requirements of service.

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Guage, 3 feet 6 inches; Cylinders, 13 inches × 20 inches; Working pressure, 170 pounds; Fuel, soft coal; Driving wheels, diameter, 40½ inches; Weight, 72,700 pounds.

In the shunting engine illustrated, a few of the characteristic Baldwin features are as follows:—

Accessibility of all parts for repair or replacement.

Convenience in cab for engineman and ample room for firing.

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Exceptionally well equalized. Can be operated with minimum injury to tracks.

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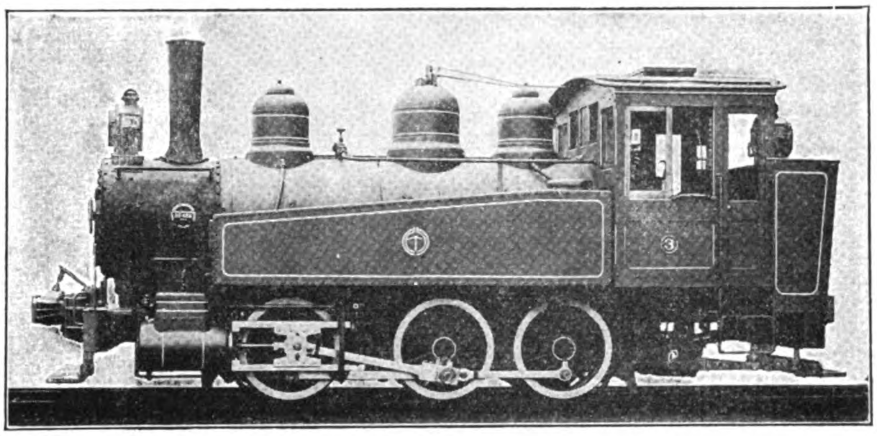

SIX-WHEELED SHUNTING ENGINE BUILT FOR HOKKAIDO, KOGYO TETSUDO, K.K. (JAPAN)

Springs conveniently placed on short saddles directly over the journal boxes and connected with equalizing levers in the same plane.

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Unusually large journals for driving axles and crank pins, insuring maximum life with minimum wear.

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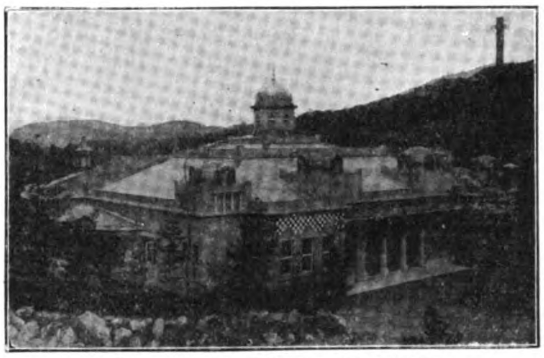

Arima. Radium Spring Bath-house

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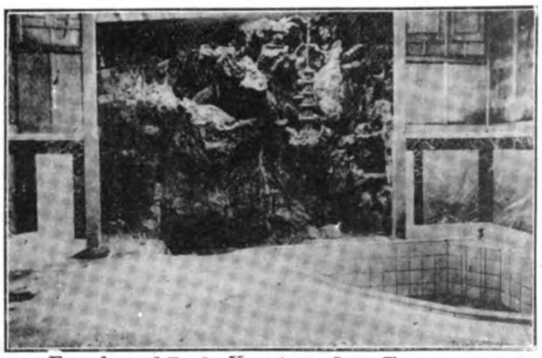

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RAILWAY

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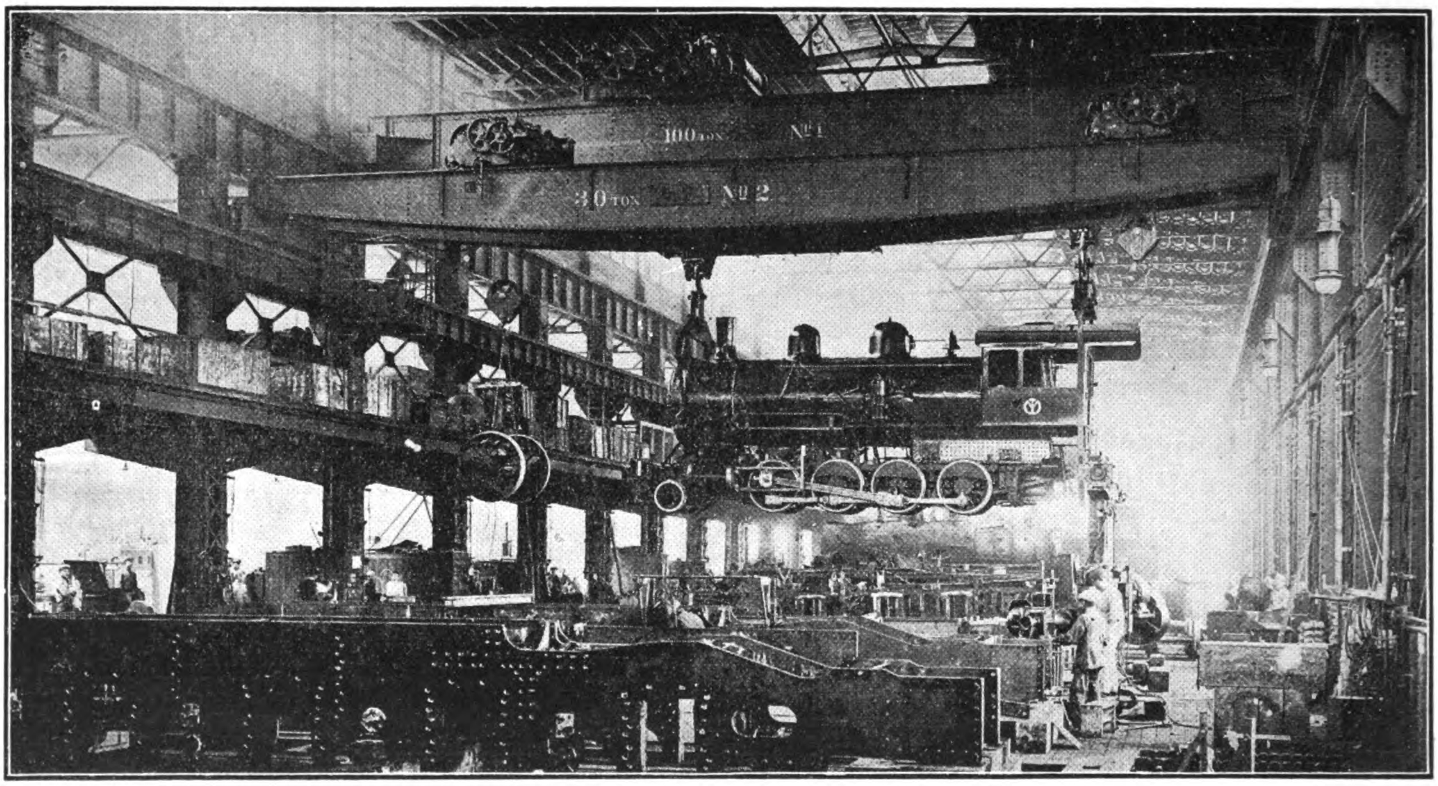

Interior of Engine Erecting Shop, Shakako Shops, S.M.R.

LARGEST AND MOST COMPLETE IN ALL MANCHURIA AND CHINA

AREA OF LAND: About 300,000 Tsubo. OFFICES & WORKSHOPS, 14,000 Tsubo

CAPACITY OF EXECUTING REPAIRS SIMULTANEOUSLY:

27 Locomotives, 36 Passenger Cars, and 130 Freight Cars, besides Constructing and Repairing other Railway Materials, Mining Machinery, etc. Employees: 5,000 Japanese and Chinese.

THE EAST IS EAST AND THE WEST IS WEST

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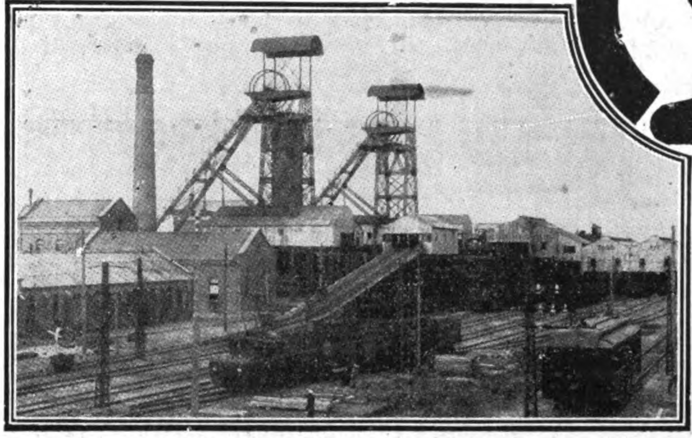
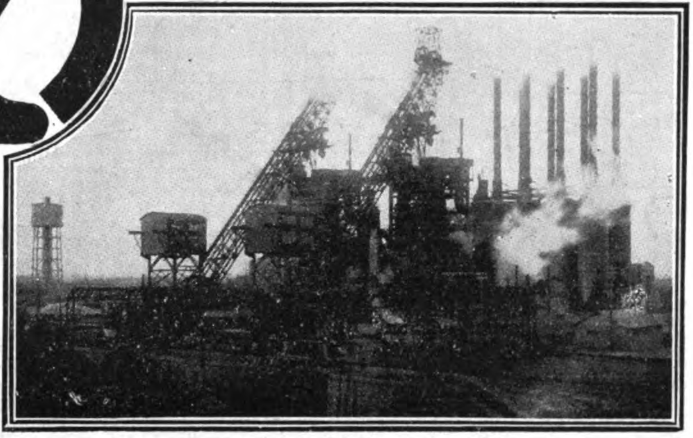


Togo Pit of the S.M.R. Fushun Collieries



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New Enterprise Set Up Like Magic Amidst the Wilderness of Manchuria.

TRACT OF LAND: about 4,000,000 tsubo.

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MEANS OF TRANSPORTATION in the plant: 24 miles of railway and 2.5 miles of electric tramway in operation, with three light locomotives and a number of slag-, coke, and ore-cars of from 8 to 24 tons.

A NEW TOWN SITE of 400,000 tsubo, with the necessary roads and water and sewage services, laid out and rented to lessees.

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BUT THE TWAIN HAS MET AND BLENDED HERE

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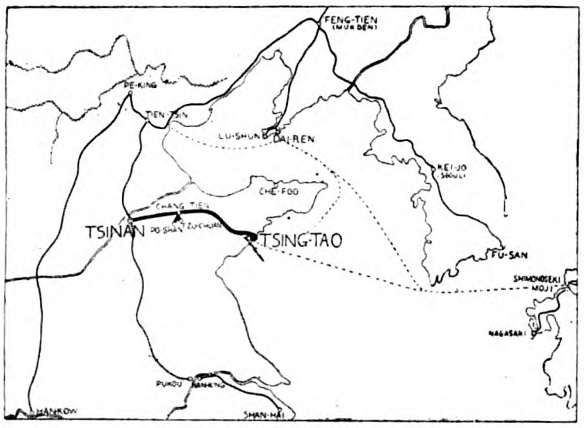


THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway. At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 10.00 p.m. arrives Tsinan 8.00 a.m.
Train No. 3 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.40 p.m.
Train No. 2 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 8.35 a.m.
Train No. 4 leaves Tsinan daily 10.10 a.m. arrives Tsingtao 8.20 p.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30; 2nd class, $7.20.

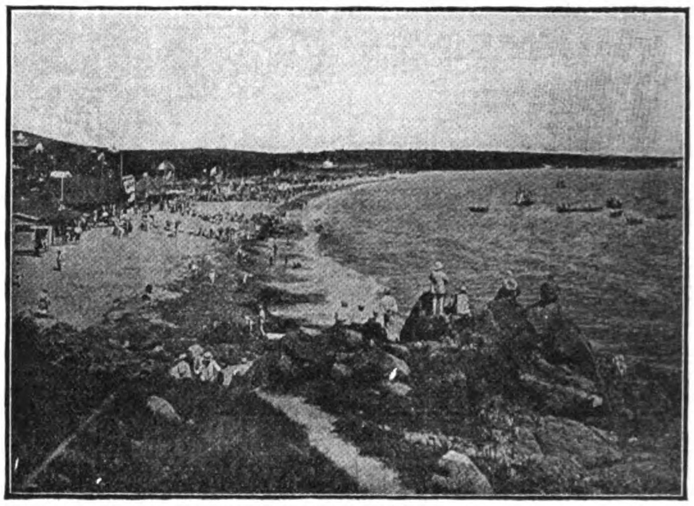
First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



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Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

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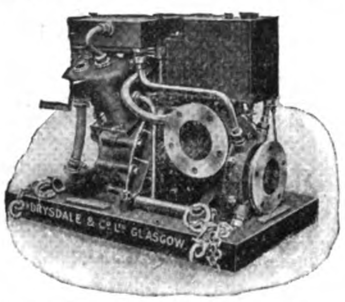

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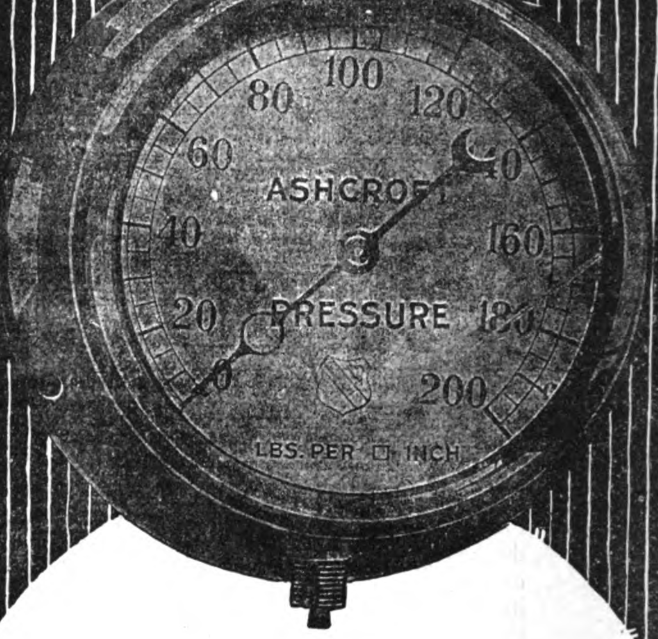

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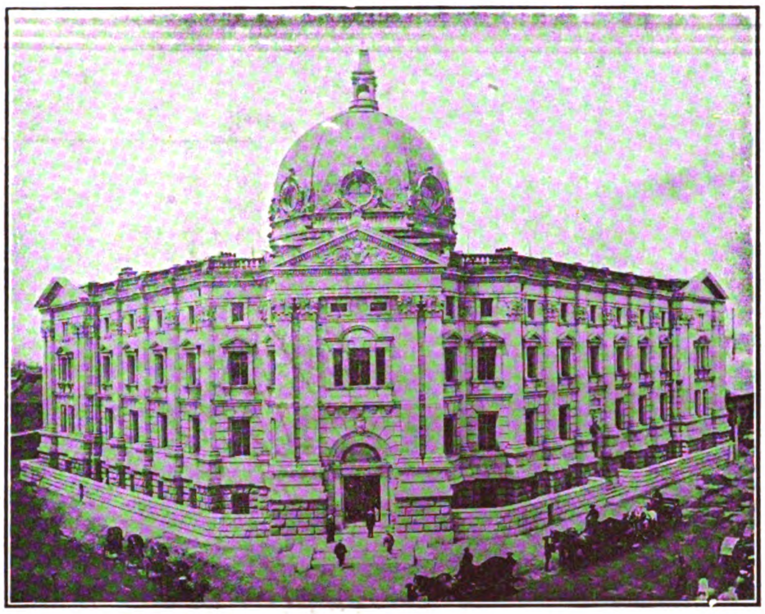

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